The Builder.

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Baalbek.—The City of the Sun.

WHEN you occupy a country, and wish to hold it, carry roads through it. The force of this maxim of the Iron Duke has been duly recognized by our Continental neighbours, or, at least, by their ruler. Napoleon III. has also proved himself a man of *metal*, for he has carried his macadamized boulevards right through the strongholds of the vanquished Parisians. No more paving-stones to play with, my little *gamins*,—no more narrow lanes for ambuscades, my gentlemen of the red,—but broad imperial ways, easy for the passage of artillery, and affording elbow-room for *indigenes*, who will fall to work with a will on the first occasion you afford them. From these premises we may infer that the French, or, rather, he, the embodiment of the French will, intends, or intended, permanently to hold Syria; for he has carried a noble road, also macadamized, right over the summit of Lebanon, through the centre of the country from Beyrout to Damascus, and has established khans at proper intervals, with relays of horses for the diligences which have commenced running. Whether or not this road was begun by the French army, during its temporary occupation of Syria, or by the company who are finishing it, we know not; but we do know, that in whatever way it will be accomplished, it will be a great and good work, tending greatly to the comfort and security of travellers in that insecure and comfortless country. It is the path by which civilization will penetrate to the very edge of the desert; for that great civilizing power—Commerce—is already covering it with her caravans.

At the time of our visit to Damascus it was only completed three parts of the way, and the diligence only travelled half the way, the rest of the journey being accomplished on horseback. On our return from that interesting city we left the road in the great plain of Bekaa, which lies between Lebanon and Antilibanus, and is from six to ten miles wide and one hundred long, stretching from above Hums to Mount Hermon. We left the road in order to visit the ruins of Baalbek, which were situate a day's journey to the northward. A conveyance was to have met us at the branch road to Zakleh, but, as the Americans say, we "missed connexions," and proceeded to the town on foot, leaving our dragoman in charge of our saddle-bags. The plain of Bekaa is quite flat, well cultivated, but without trees. In this part of it the French army was encamped many months, so the Christian boys of the neighbourhood saluted us in our progress with "Bon jour," much at first to our astonishment. Zakleh, the largest Christian town in the district, is recovering its opulence after the depressing results of the massacre; and we noticed that new convents were being built upon the sites of those that were destroyed, and in a manner to resist the attacks of Arabs and Druses. We found there a hovel, dignified by the name of hotel, where we had breakfast, and where we were shortly joined by Michael, our dragoman.

We went then into the market-place to hire mules; and, having at last been successful, mounted in haste in order to reach Baalbek, if possible, before sunset. Our road lay athwart the plain to the north-east. For some miles cultivated fields without hedges or other inclosures were visible on both sides of us, and we passed at first through villages inhabited by those sons of Ishmael who had become domesticated, had relinquished "the road" to their brothers the Bedouins, and had taken to the field instead. After a time the cultivation and villages ceased, and we had around us the usual sand, stones, and brushwood. Though our progress was but slow, the wonderful grandeur of the scenery consoled us. The snowy range of the White Mountain on the one side, and on the other the red peaks of Antilibanus,—which seemed to have been burnt by the sun's rays until they had the appearance of mountains of brass,—kept company with us all day long, and as evening approached, overshadowed us,—too soon, alas! for they obscured the great pile of the temple of Baalbek a few minutes after we came in sight of it. We had but time to gain a glimpse of its grandeur in the short twilight, for night overtook us while we were yet miles from the ruins. It is not pleasant to be benighted in the East, for the roads are stony and difficult to follow, as there are in general no boundaries to them; but fortunately Michael knew the road well, and, after a few stumbles, we at length reached the village which adjoins the ruins in safety, and obtained quarters in the house of a Christian family. At the end of a courtyard there was an oblong building, consisting of two living-rooms, divided by an open archway like the *iwan* of the houses of Damascus. Unfortunately one of these rooms had no floor, as it was but newly built, and consequently while some of our party occupied the remaining apartment, others had to seek rest in the open archway,—to seek, but not to find it, for myriads of fleas held their revels there and banished sleep. But "it is an ill wind that blows nobody good;" for to these little tormentors we were indebted for one of the most lovely sights eye ever beheld. They were the cause of our being roused at daybreak in time to see the sun rise over the ruins. Hurrying to a hill in front of the house, we gained a perfect view of the whole plain.

Looking over the flat-topped houses in the foreground, we beheld the broad plain of Bekaa still wrapped in grey shadow. Beyond it rose the lofty chain of Lebanon, whose jagged summits were just lighted up by the rosy light of morn; every ravine in its indented sides by degrees became distinctly visible, even to its purple depths. In the foreground of this majestic picture of nature rose the huge dark mass of masonry, one of the grandest of man's works, apparently an immense fortress, rising high above the houses and groves of trees which surrounded it, and surmounted by six slender columns. At first it looked gloomy and sombre, but little by little the sun's rays painted cornice and capital with rich rose madder, bringing out clearly every detail, admirable in contrast with the mass of green foliage beneath. Rapidly the shadow fled across the plain before the pursuing ray, till it was finally gathered up into a small space at our feet, and old Baal resumed possession of his early inheritance—Heliopolis, the City of the Sun—to reign there royally for the next fifteen or sixteen hours. We have seen the sun rise upon the Alps from the summit of the Superga, near Turin; we have watched it tip with gold the minarets of Stamboul; we have seen it gild the sides of the Pyramids; but we never remember to have beheld such a splendid effect as when we witnessed his return to the city which bears his name,—and we owed all this to the fleas!

Upon descending to breakfast—for we early birds are always ready for our matutinal worm—we were glad to find that Michael had provided a substantial meal. After heartily discussing it, we made our way to the ruins. Upon approaching them, we found that they consisted of temples and other edifices, erected upon an immense platform, some 20 ft. or 30 ft. above the level of the ground, and enclosed by a wall heightened in Arab times, so as to form altogether a vast fortress, 1,000 ft. in length, from east to west, and 500 ft. in breadth, from north to south, with walls varying from 60 ft. to 80 ft., or even 100 ft. in height. The platform was originally reached by a flight of lofty steps, at the east end, removed by the Mahometans, and replaced by an embattled parapet. There appears to be no mode of access to the terrace except through a breach at the south-west angle, though there is in reality another through a subterranean passage. But before entering we will walk all round the pile,—which may be called the acropolis,—and remark the construction of the platform, looking especially for the three great stones mentioned by all travellers, which, from their dimensions, have given the temple at Baalbek, the name of Ἱερον Τριλιθον.

The east end is entirely occupied by the propylæa. The columns of the portico no longer exist, but their bases and pedestals have been built into the embattled parapet. There were originally twelve columns, which were flanked by a pylon, 25 ft. square at each end. These pylons stand entire, and have four pilasters on each face; the cornice of the podium is returned on both the north and south sides. Upon the entablature surmounting the pilasters, a wall has been erected by the Arabs, so as to make the total height of the building at this point almost 100 ft. above the level of the ground.

On the south side the wall is continued for the full height, to a distance of 30 ft.; here it juts out at right angles to some 50 ft. In the east face of the projection there is an entrance to subterranean passages, which run through the basement. These we shall afterwards describe. The remainder of this side is formed by the walls of a Saracenic palace, which occupies the corner of the platform; beyond it the barrier is formed by the south wall of the cella of the Temple of Jupiter and by the columns of the peristyle: eleven of these have fallen, but four remain standing. Roberts chose this point for one of his most beautiful sketches. Beyond the Temple occurs the breach already mentioned, as existing at the south-west angle.

On the west side we find a plain unbroken wall, and at the north-west corner the three enormous stones that we were seeking form apparently one unbroken course, 186 ft. in length by 13 ft. in depth, for they are so nicely laid that the joints are not easily to be discerned. We should suppose the temple to have been built upon rock levelled to receive it, if these stones had not other smaller courses beneath them, and if we did not see, on turning the corner, at least six other stones of large dimension, ranging with them, and forming with them part of the original temple, built by the Phœnicians, or by Solomon, as the Arabs say. According to them, this edifice was built by that monarch as a sort of country mansion, where he could retire to divert himself with his 1,001 wives: no great sin in their eyes. We wonder that they do not associate in their imaginations these stones with the time of the giant Noah, whose tomb was visited on our return, at Neby Nouh, near Zakleh. It is a coped tomb, about 4 ft. above the ground, and 100 ft. long, showing the full stature of the truly great patriarch. We are giants in science and inven-

tion, but we have never moved a stone weighing 1,000 tons a mile's distance: perhaps because we never had occasion to do so. The quarry from which these stones were hewn is almost a mile from the temple, and there is another stone lying in it of still greater dimensions than these, being 68 ft. 4 in. long, 17 ft. wide, and 14 ft. 7 in. high, according to those who have measured it. It is tilted up at one end, all ready to be moved by rollers or whatever means were employed by primitive builders.

On the north side there is an outer wall, composed of the above-mentioned large blocks. It is about 15 ft. or 20 ft. high, and is some 20 ft. or 30 ft. distant from the higher wall, which supported the peristyle of the Temple of the Sun, leaving a sort of fosse between. Beyond the peristyle of the temple the main wall juts out at right angles, passing beyond the end of the lower wall. The cornice of the podium begins here, and is continued round to the eastern side. In the west side of the projection is another entrance to the subterranean corridors, and there are two pilasters above it, ranging with those of the portico.

If we clamber through the breach at the north-west angle, we find ourselves on a platform lower than the general level of the enclosure. Upon it stands the Temple of Jupiter, which, after the Temple of Theseus, is the most perfect existing; and which in its dimensions exceeds the Parthenon. It is octastyle and peripteral, and of the Corinthian order. The portico had three rows of columns, and was larger than that of the Pantheon at Rome. Most of these columns are standing; those on the north side stand entire, with their entablature and with a great part of the ceiling of the peristyle, which consists of a flat segmental curve, formed of single stones laid side by side. The soffits are most elaborately ornamented with hexagonal compartments, each filled with a group of figures. Three columns of the posticum are also standing, but those on the south side have for the most part fallen down.

The doorway of the temple has been so often described by able pens, and delineated by able pencils, that we shall not attempt to picture it in detail; suffice it to say, that the architraves are single stones 42 ft. high. The lintel is of three stones, the centre stone of which slipped down 3 ft. or 4 ft., but remains suspended, as though ready to fall upon the intruder into the adytum of the temple. The internal walls have engaged columns, the spaces between them being filled with two rows of niches. Inscriptions inform us that this temple was erected in the time of Antoninus Pius.

Such being the smaller temple, what must the larger have been in its pristine state? Now there are but six columns of the southern peristyle remaining. These stand upon a supporting wall on the general level of the upper platform. Wood and Dawkins restored this temple, and from their plan it appears to have been decastyle, peripteral, and most probably hypæthral, standing upon a high podium, which upon the north and west sides rose straight from the level of the ground. The shafts are 62 ft. 4 in. high, and the total height, with the entablature, is 76 ft. Thus they were the highest in the world. This stupendous structure was approached through an atrium about 350 feet square, lined with *exedræ* and ornamented with numerous columns and niches. This again was approached through an outer and smaller court, likewise lined with *exedræ* and niches. Portions of the former, and a great part of the latter still remain. The decoration is extremely rich, though not what we should consider pure in style. This outer court terminates in the grand eastern portico, which had twelve columns, 4 ft. 4 in. in diameter. We quote these dimensions from various authorities, as we had not time to measure, but simply to explore. After a general survey of the ruins on the platform, we visited the subterranean corridors—not the least interesting or curious part of the structure. There are two long vaulted passages running the full length of the platform, or nearly so, connected by transverse galleries. They are partly built of immense blocks, evidently of the same date as the large stones at the north-west corner; the greater part, however, is Roman work. These passages have never been thoroughly examined. Dr. Robinson appears simply to have peeped into them; others seem to have devoted their time exclusively to the examination of the upper work. We observed in our exploration an opening in the south wall of the southern corridor about 6 ft. from the ground, and, with the assistance of Michael, managed to scramble into it; but not being furnished with lights, did not venture to descend on the other side. It was too late in the day to go for candles, so we unwillingly deferred our visit till the next day, and retired to our flea-haunted mansion, when we were rejoiced to find that our hostess had actually procured and cooked chops for dinner—an unusual luxury in a country where butcher's meat is rarely to be obtained by hungry travellers.

Early the next morning, having supplied ourselves with candles and the only ladder in the village, we returned to our underground researches, and were rewarded by the discovery of an arched chamber about 20 ft. square. The ceiling was semicircular, elaborately enriched with caissons filled with rosettes, and at the sides of the room there were rich niches with pediments over them. This chamber had evidently been open to the exterior at one time, as the end wall was of more modern days, and the crevices between the stones admitted faint rays of light. What this chamber could have been it is difficult to say. We have not met with any notice of it either in Wood, De Saulcy, Robinson, or any other writer, and we therefore feel ourselves at liberty to suppose that it was not remarked by them; the whole building is a fine study for the archæologist, and has to be thoroughly explored, measured, and explained by some future traveller, for it is without doubt the finest pile of ruins in the world as far as grandeur and completeness go.

Not far from the acropolis, as we may venture to call the fortified enclosure, stands an elegant little octagonal structure, which Miss Beaufort aptly terms the *boudoir* of the gods; each side is curved concavely, and at each angle there is a detached column, about which the entablature is returned. It is circular in the interior, 38 ft. in diameter, and has had a domical roof, the lower courses of which remain.

There are many other objects worth a visit in Baalbek: for instance, the quarry where is the great stone, and in which there are various rock dwellings, apparently those of anchorites; the magnificent source of most limpid water forming a small river which fertilizes this part of the plain; a ruined mosque with three rows of pointed arches springing from classical columns, no doubt taken from the court of the temple; and the walls of the ancient town, which, with their gates, are almost entire, enclosing a great tract of ground, a corner of which is occupied by the modern village. All these are well worth visiting; indeed, a residence of several weeks would be necessary to enable a person to see the place thoroughly. But Michael was inexorable, and, after the second day, we unwillingly mounted our mules, and turned our faces with regret towards the Neby Nouh.

ENGINEERING ARCHÆOLOGY.

THE HISTORICAL LOCOMOTIVES AT KENSINGTON.

People talk very glibly about invention and its progress, but we have often had occasion to notice that but few have any clear notion of what industrial invention really is, while a philosophic history of invention has yet to be written. Invention has been termed the poetry of science, and one popular belief about inventions would maintain that they are struck off like the stanzas of a poetical *improvisatore*. But very few inventions, however, could be traced to such a source, and the history of the arts shows that time, accident, and tentative experiment are, after all, the greatest inventors. One of the chief features observable in the maturity of any invention is its gradual and slow evolution, by the work of many brains, of many hands, of many circumstances of time, place, and chance. So slow and gradual is this progress, that the different stages in its history are as difficult to note as would be the progress of the hands of a clock unprovided with a dial-plate; and the different stages are difficult to determine, not merely with regard to entire machines or processes, but also with respect to the different details and minor operations making up these engines or these processes. As a natural result, when inventors or their descendants do at last come to understand the importance and value of what they have been doing, there take place endless controversies as to priority of invention. Witness that of the blast-pipe, for which there are several claimants. The importance, for reasons of social and commercial polity, of determining the laws of the development and progress of industrial improvement is scarcely recognized,—although the patent law and other laws bearing on inventions may be supposed to have some such theoretical basis. A generalization of this kind could only be conducted on a firm groundwork of historical truth, and there are many difficulties in the path of an investigation in this direction. To mention only one. There is scarcely one important modern invention which is not claimed for a distinct and different inventor in each of the more important civilized countries of Europe. The first originators of many of the different important steps in the elaboration of the steam engine are thus subjects of fierce contestation between the *savants* of England, France, and Germany. It would be scarcely possible to get at any true account of a question of this kind without studying the records and claims in these three languages at least. It is the French who show the greatest ardour and vivacity in these discussions; and, we regret to say these patriotic sentiments have not in all cases been tempered with many scruples as to the means of maintaining, or rather of annexing, honour of this kind. We say this advisedly, having in our memory some yet unpublished discoveries as to the history of the steam engine.

We thus look upon the Museum of Patents at Kensington, mainly founded by Mr. B. Woodcroft, and greatly extended by the zeal of the present Curator, Mr. F. P. Smith, as being of yet greater importance than is generally acknowledged. This Museum, even in its comparatively undeveloped state, is not merely an historical record of inventive progress,—is not merely a museum of engineering archæology,—but is also a place whence may be drawn some most valuable lessons towards a philosophic theory of the development of invention. One lesson, apparent to the most casual observer, is that an invention is not a thing of spontaneous, inspired, production, but is rather a plant of slow growth,—sown, nourished, tended, and reaped by many different hands. This view is a rather disenchanting one to take, however true it may be. The popular imagination seems to always require a corporeal object for the embodiment of its fancies. It delights in a hero, its sight does not range so far over the intellectual horizon as to perceive a principle,—it can only see a person. It is forgotten that men's powers—the term being used in the widest sense—differ but little in extent from the physical stature of a given number of persons. The popular belief thus, for instance, invests Watt with the invention of the steam engine; Arkwright with that of spinning machinery; Fulton with marine propulsion by steam; George Stephenson with the first invention of the steam locomotive. A brief account of the locomotives already existing in the Kensington Museum of Patents, would dispel this last belief, and even without greatly shortening George Stephenson's status. At the time we write too, the celebrated "Sanspareil," the rival engine to Stephenson's "Rocket," built by Stephenson's rival, Timothy Hackworth, is just now being re-erected in the Museum, in company with its former competitor of the famous contest on the Manchester and Liverpool Railway, in 1829.

In the matter of priority of invention in, or rather of attempts at, land propulsion by steam, the French may well claim to be our *devanciers*, and we do not think that any true Englishman will be inclined to grudge them this honour. The first steam-carriage seems to have been made by a Frenchman, Cugnot, in 1769,—that same marvellous year which witnessed the birth of Napoleon I., Wellington, Humboldt, Mehemet Ali, Lord Castlereagh, Sir M. I. Brunel, Cuvier, and the first patent of Arkwright, the first patent of Watt, as also some other events almost as great in their eventual influence on the present era. An engine made by Cugnot is still in existence in the Conservatoire des Arts et Métiers at Paris. It has a copper boiler, very much like a common kettle without the handle and spout, furnishing with steam a pair of 13-in. single-acting cylinders. The engine propels a single driving-wheel, which is roughened on its periphery. Altogether, this engine bears considerable testimony to the mechanical genius of its inventor. It was unsuccessful, having got overturned once or twice on the very bad roads then existing in France, and it was put on one side. It is stated, however, that arrangements were made, in 1801, to put it to work in the presence of Napoleon Bonaparte. The departure however, of Napoleon for Egypt, prevented the trial,—a circumstance which recalls Fulton's subsequent unsuccessful ne-

gotiations with Napoleon for aid in attempting marine propulsion by steam. Watt then, in 1784, patented a locomotive engine, the boiler of which was to be "of *wood*," hooped like a beer-barrel. Watt, however, had not much faith in steam carriages, and he objected to the attempts made in this direction in 1784 by William Murdoch, his very able assistant. The miniature engine made by Murdoch in that year is still carefully preserved at Soho. Careful and elaborate researches, such as those lately made by Mr. Zerah Colburn* into the history of the locomotive, seem to more and more confirm existing impressions as to the great part done by Trevethick in the introduction of the locomotive engine. In 1802, he and his moneyed partner Vivian patented the application of the high-pressure engine to steam carriages, and one of these was made, put to work in Cornwall, and exhibited in London. A model locomotive, made by Trevethick in 1802, is now in the Museum of Patents, at South Kensington, having been found out in Cornwall by the present curator, Mr. Francis P. Smith. The boiler is fitted with an internal double flue, and a chimney of small diameter. Mr. Colburn has shown clearly enough, in spite of previous misstatements, that Trevethick understood the value of the blast formed by the exhaust steam when turned into the chimney, and the practical sufficiency of the adhesion between smooth metallic surfaces for propelling the locomotive and its load. Trevethick's engine of 1804 was able to work over a rough tram-road at the rate of 5 miles an hour; but in Cornwall, where fuel was then so dear, the comparatively high quantity of coal consumed rendered this performance of inferior commercial value. The Northern districts of Newcastle-on-Tyne clearly offered the fairest opening for the childhood of the locomotive, and accordingly, Mr. Blackett, the proprietor of Wylam Colliery, wrote in 1809 to Trevethick respecting his locomotive. It appears that, at the time, Trevethick replied that he was too much engaged; but in 1811, however, he sent an engine to Newcastle. It was not put on the Wylam railway, but set to drive a foundry.

At this time a locomotive was being made by Murray, of Leeds, at the order of Mr. Blenkinsop, of Middleton Colliery, near that town. It will be remembered that Mr. Blenkinsop's name is connected with the employment of a strong rack rail on the line, into which worked a toothed pinion driven by the engine. A horizontally-placed cylindrical boiler was used, in which were placed two vertical steam cylinders. The boiler had a single internal flue, containing the grate at one end,—like a Cornish boiler,—while the chimney rose out of the other end of the flue. A pair of cranks on each side of the engine drove a toothed wheel, and these two wheels themselves propelled a larger toothed wheel, on the axis of which was a pinion with coarse teeth working in the rack rail. With such a light engine as one of 5 tons, and working at the slow rate of only 3 miles an hour, Mr. Colburn considers that we should be obliged to use a rack, and that thus Mr. Blenkinsop did not deserve the ignorant ridicule which has been directed against his rack and pinion. In fact, Murray's engines on Blackett's plan were the first locomotives ever worked permanently and on a commercial scale, and this line between Middleton and Leeds is in reality the first commercial railway. It is not, perhaps, generally known in England, but it is stated by Mr. Colburn, that "as late as 1848 the rack rail was adopted upon an incline of 1 in 17, on the Madison and Indianapolis Railway," in the United States. "This incline, which has since been superseded by a line with practicable gradients, rose from the north bank of the river Ohio at Madison, and was about five-eighths of a mile in length." The engines provided had five steam cylinders in all, actuating, in a way not to be made clear without a sketch, a cogged wheel working on a rack rail.

The next step was the commercial working out of the adhesion of the driving-wheels. This was done by William Hedley, the colliery viewer of Mr. Blackett, of Wylam; but it is probable that this would have been done by any one who first built a rather heavier engine than that of Murray's. Hedley thus, in 1813, constructed the engine now in the South Kensington Museum, but which has been at work near Newcastle down to such a recent date as 1863. It has been known there many years under the name of the "Puffing Billy,"—a nickname given to its maker, Mr. William Hedley, by the colliery hands, from the fact of his being rather stout, with a consequent shortness of breath. Mr. Hedley first of all made an engine somewhat like that of Trevethick's, with a cast-iron boiler, provided with a single internal flue, and working by adhesion on a smooth rail. This engine was not very successful, from a deficiency of boiler power, and from the fact of its having only one cylinder; but it clearly proved the possibility of doing away with the expensive and cumbrous rack. The "Puffing Billy" was then made. The inscription on it states that it was built in 1813, by Jonathan Foster, engineer, of Wylam colliery, under the superintendence of Mr. Blackett, owner, and of Mr. Hedley, viewer of the colliery, in order "to haul coal-laden waggons along a railroad to Lemington, where the coals were shipped in keels." This railroad was a substitute for the old tramroad, and was laid down on the site of the latter, between the years 1807 and 1811. The "Puffing Billy" has a wrought-iron boiler, containing a return flue,—the chimney being at the same level as the fire-door. There are two vertical cylinders, driving beams centred each at one end, termed the "grasshopper" beam—a plan first due to Oliver Evans. The motion of the wheels is given to the four wheels by toothed gearing. An original document of great interest and instructiveness, is framed and glazed and hung to this engine. It appears that the noise and smoke made by this engine were considered a nuisance by some of the people living in the districts it traversed. They accordingly threatened to indite the "Puffing Billy" as a nuisance, and their complaints were so strongly urged, that Mr. Blackett found himself obliged to take counsel's opinion on the matter. The barrister, no doubt a noted one in his day, evidently agreed with the neighbours in the ir bad opinion of Mr. Blackett's engine. The case being put to him, he writes on the back of the document, that,—"It does not appear to me that there is any objection arising from the lease itself, to Mr. Blackett's conveying his coal-waggons by means of this steam-engine; but I think that the use of such an engine may be deemed a nuisance to A. if the smoke and noise occasioned thereby render his habitation unhealthy or uncomfortable; but this must entirely depend upon the quantity of smoke and noise so occasioned and the distance of the house of A. from the waggon-way,"—(signed) R. Hopper Williamson, Newcastle, 12th September, 1814. But the most amusing bit is a note, apparently the result of an afterthought of the learned lawyer:—"If the noise of this engine disturbs the cattle grazing on the land adjacent to the waggonway, so as to injure them with regard to their feeding, I think it may be considered a nuisance." In all probability Mr. Williamson's capacity was rather above than below the average; but this is one of many more instances that shows the difficulties to be encountered in the introduction of any new thing. It is not very likely that such an opinion would now be given, or that we shall ever abolish locomotives for fear of disturbing the digestion of grazing cattle; but the first thing has been done, and the introduction of traction engines is just now greatly impeded by the same difficulties which beset the Puffing Billies of 1813. At the same time, it is clear that horses are more liable to be frightened by an engine on common roads than on a line,—or, rather, more properly speaking, the engine is brought within sight of a greater number of horses when it is made to travel on a common road. But it is well known that horses very soon get accustomed to a railway locomotive, and there is no doubt that they would just as soon forget their fear with a traction engine.

About a couple of years after the construction of the "Puffing Billy," Mr. Hedley built a yet more efficient engine for the Wylam Railway. In the same way as he had first put to commercial use the adhesion of smooth surfaces for railway traction, so did he first apply the return-flue boiler and the narrow chimney. By the way, talking of "adhesion," we think that this term is often used very improperly. Adhesion only takes place between two surfaces of the same substance, of the same—or of nearly the same—molecular structure, and consequently similar surface. Adhesion thus does not take place between a cast-iron surface and a wrought-iron surface,—between (say) a cast-iron wheel and a wrought-iron rail. The grip is in this case produced by simple friction without any adhesion, properly so called.

A careful observer of the doings on the Wylam Railway was George Stephenson, and he persuaded his employers at the Killingworth Colliery to construct an engine which was finished towards the middle of the year 1814. Its boiler, 8 ft. long and 34 in. in diameter, was carried on four 3-ft. wheels, and provided with a single internal flue. Two vertical cylinders were placed for half their length in the boiler. The motion for driving the wheels was almost the same as that in the "Puffing Billy." It is stated by Mr. Smiles that the speed of this first engine of Stephenson's was only three miles an hour, and a year's trial with it showed that it had no advantge in point of economy over horse-power,—being thus much inferior to Hedley's engines. This weakness of Stephenson's first engine was due to the low boiler power produced by the use of a single flue and a chimney of large diameter with its weak blast, unaided by exhausting the waste steam into the chimney. In 1815, Stephenson made his second engine, according to the patent which he took out in that year. A different kind of gearing was adopted for driving the engine, and additional adhesion was obtained by coupling the wheels of the tender to the engine by means of an endless chain. Stephenson also used springs, according to a suggestion of Mr. Nicholas Wood. George Stephenson also applied a strange and even absurd scheme to some of the Killingworth engines as a substitute for springs. This consisted in adapting a number of pistons sliding in cylinders fixed to the bottom of the boiler, and in communication therewith. Stephenson, in his own words, supposed that as they "acted upon an elastic fluid, they produced the desired effect with much more accuracy than could be obtained by employing the finest springs of steel to suspend the engine." Of course, the plan had to be at last abandoned, after some unsuccessful trials. At this time, and some years previously, the placing of steam-carriages on common roads was being attempted,—a feat which is now being carried out in our own time mainly for agricultural purposes. The wedding of the wheel and the rail put an end for the time to the experiments in this direction, conducted by Griffiths, Gurney, and others. Mr. Colburn remarks on these experiments, that while road locomotives had ample adhesion, they only lacked evaporative power. "The steam blast, which for railway engines running at a slow speed, and having insufficient adhesion, was as yet hardly required, nor, for some of these engines, even admissible, was therefore of great importance to the road locomotive engineers. Goldsworthy Gurney, then a surgeon and lecturer at the Surrey Institution, has claimed the discovery of the properties of the steam-jet in 1820,— the year, by the way, in which Nicholson's patent for various applications of the steam-jet expired. In 1820 and 1821, Gurney employed the jet for promoting combustion in laboratory furnaces, for decomposing various compound bodies, and for working platinum; in 1824 he applied jets of steam, taken directly from the boiler, to increase the draught in the chimneys of the steamboats *Alligator*, *Duchess of Clarence*, &c.; in 1826 he applied steam in the same manner to increase the draught in the chimney of his road-locomotive; and in an *ex parte* statement not long ago published by Mr. Gurney, he alleges that he "supplied Timothy Hackworth with the blast-pipe employed by that engineer in the locomotive 'Sanspareil,' which so nearly won the Liverpool and Manchester prize in 1829." It would seem, however, that Hackworth used the single contracted blast orifice about two years previously to 1829.

Timothy Hackworth was a practical engineer of much ability, and, though not so successful as George Stephenson, it is probable that his mechanical powers were little, if at all, inferior. He helped to make the "Puffing Billy" at the Wylam Railway; in 1824 he was the manager of George Stephenson's locomotive foundry at Newcastle; becoming, in the following year, the locomotive superintendent of the Stockton and Darlington Railway. The engines of this line, opened in 1825, were made by Stephenson, and they gave such bad results that it stated that the directors, as late as 1827, were thinking of altogether giving up locomotives. Hackworth, however, took in hand one of the engines on the line, made by Wilson, of Newcastle. Hackworth applied the return-flue to the boiler, and, above all, he applied to it the blast-pipe. The "Royal George" was thus the best locomotive of its time, as it was, besides, fitted with the then novelties of "a cistern into which, a portion of

* "Locomotive Engineering." Glasgow: W. Collins, 1864.

the exhausted steam could be turned to heat the feed-water: it had short-stroke force-pumps, worked by eccentrics; adjustable springs, instead of weights, upon the safety-valves; and a single-lever reversing gear."

Two years after the application of these improvements to the "Royal George," in 1829, took place the Rainhill trials on the Manchester and Liverpool Railway, which had the effect of bringing to a head most of the existing knowledge in locomotive traction. One of its most important results was the first application of the multitubular boiler to the locomotive. The invention of this important form of boiler has afforded, and still affords, a field for both intestine and international wars as to its priority of invention. The English claim the multitubular boiler; so do the French; and so do, we believe, the Americans. Perhaps a Chinese claim may be yet put forward. In the mean time, Mr. Colburn shows that it was first prepared by a London engineer, Mr. James Neville, of Shad-Thames, in specification No. 5,344, A.D. 1826. This is an important document in engineering archæology, as it annihilates the pretensions of the French claimant, M. Marc Séguin, who only patented the multitubular boiler in France in 1828.

Thus were combined and brought into practice all the essential points of the present locomotive, which has only been since improved by, in the main, the mere effect of time,—of time and experiment, eliminating inferior forms of detail. Nevertheless, the then existing locomotives were by no means very successful machines; such distinguished engineers as Messrs. Walker and Rastrick reported against their use on the Liverpool and Manchester Railway; and they were confirmed in their impressions by a man of such ability as Mr. Nicholas Wood, who (just as Smeaton firmly believed that steam-engines could never do better work than pumping up water for water-wheels), gave it as his conviction that no locomotive could be made to go faster than 8 miles an hour. Thus, even so late as the spring of 1829, the directors of the Liverpool and Manchester Railway were thinking of applying fixed engines and ropes for working the line. Fortunately, however, the counsels of two or three members of the board prevailed, and it was decided to make a last trial of locomotives. As one of George Stephenson's engines had already failed on the line, a prize of 500*l.* was publicly offered to all comers on the 25th of April, 1829.

The conditions that engines had to fulfil have been often published. One of these was, that the engines should burn their own smoke; and it is a pity that this "condition" has not even now, been fulfilled, as every railway passenger knows to his cost. The only engine ready at the appointed time was the "Rocket," entered by Robert Stephenson; Hackworth's "Sanspareil," Braithwaite and Erichsen's "Novelty," and Mr. Brandreth's "Cyclops" were not ready at the appointed time. The "Rocket" and the "Sanspareil" (both somewhat altered) are now in the Kensington Museum, the last, as we have stated, being just now there re-erected. Both are four-wheeled engines. The boiler of the "Rocket" is traversed by a number of copper tubes, and its two inclined cylinders work crank-pins on the driving-wheels at the front or smoke-box end of the engine. The honour of the application of the tubular boiler is not due to the Stephensons, but to Mr. Booth, the secretary of the Liverpool and Manchester Railway. The diameter of the driving-wheels was 4 ft. 8½ in., and that of the travelling-wheels, 2 ft 6 in.

With regard to the "Sanspareil," it is stated that this was the second engine to which was applied the blast-pipe; the "Royal George" (1827) being said to be the first.* The exhaust steam from each engine is taken into the chimney through a blast-pipe. It also appears to have been one of the first engines with coupled wheels, of which it had four. The most striking peculiarity to the eye accustomed to the present locomotive is, that the driver stood beside the chimney, the boiler being completely traversed by a return flue. The boiler is cylindrical, about 4 ft. in diameter and some 6 ft. long. The fact that the apparent front end is in reality the hind portion which was coupled to the tender, has misled some of the writers of treatises on the steam-engine, causing them to figure the tender in front. An inspection of the engine would appear to show that the driver stood on the tender in order to fire the boiler. The cylinders are vertical, and, in the original engine, were 7 in. in diameter, the stroke being 18 in. The two front wheels are fitted with crank-pins, driven by the connecting-rod of each engine. The "Sanspareil" was tried on the 13th of October, 1829. The total weight of the engine and load being 19 tons 2 cwt. The failure of the feed-pump, however, led to its stoppage, as the boiler could not be kept filled with the necessary water. It was also unfortunate with regard to one of the steam cylinders cracking through the bore into the steam vent. The rate of evaporation, and consequent tractive power of the "Sanspareil," was, however, higher than those of the "Rocket," the successful engine. It is stated by Mr. Hick, of Bolton, the donor of the engine to the Kensington Museum of Patents, that it was purchased by the Liverpool and Manchester Railway after the trials. In 1831 it was sold to Mr. T. Hargreaves, of Bolton, in order to work on the Bolton and Leigh Railway. In 1837 the old cylinders were replaced by new ones of larger dimensions, and the original wheels with wooden spokes were replaced by cast-iron wheels, with hollow spokes. It continued till 1844 on the Bolton and Leigh Railway, but was, by that time, found too small and weak. Mr. Hargreaves then removed it to his colliery at Cophall, near Chorley-lane, and fixed it over a coal-pit, in order to drive a pumping and winding apparatus, a pair of wheels being removed for a set of toothed gear. The boiler was not used, the engine being driven from a stationary boiler. It thus worked up to the end of 1863, when it was removed solely in consequence of the coal-pit being exhausted. Mr. Hick, of Bolton, happened to pay a visit last year to the Kensington Museum, and, having seen the other engines there of historic fame, he determined to add the "Sanspareil" to the number. Mr. Hargreaves then presented the engine to Mr. Hick, who, in his turn, gave it to the Museum, where, in the words of Mr. Hick's letter, the engine, after all its chequered and eventful career, may end its destiny "in peace and not in pieces." It may not be uninteresting to state, that the railway companies on the road from Bolton to Liverpool carried the old engine free of cost, according to the suggestion of Mr. F. P. Smith, that the venerable engine which had carried so many, should, in its turn, have its own carriage franked to its last resting-place.

The "Novelty," though very unsuccessful—as it was very soon disabled by an accident—displayed high constructive power, and is considered by some good judges as being in many respects the best designed engine of the four. It was a four-wheel tank engine; its boiler consisted of an upright cylinder for the fire-box, and a horizontal barrel 15 in. in diameter, and about 12 ft. long. The flame was taken from the fire-box through the barrel by means of a tube folded backwards and forwards on its way to the chimney. The two steam-cylinders were placed vertically in the framing, being 6 in. in diameter, with a 12-in. stroke. The diameter of the wheels was 4 ft. 2 in. Mr. Burstall's "Perseverance" very soon gave up, and was found unfit for the trials.

It would be a natural remark to make, that the greater number of the engines and machines which have been so long at work have been greatly altered from their original construction by the exigences and accidents of practical wear and its attendant repairs. Like John's old knife, which still remained "John's old knife," though it had received about half-a-dozen new blades in succession, and about as many new handles, it might be doubted whether these engines really represent their original construction. In one sense this may be true, and it is probable that only a portion of the original raw metal is still in combination. But then it must be remembered that in piecemeal repairs any part repair is in a great measure tied to the original form. The new blade of the old knife has to conform to the existing handle, and the new handle has to be made to the shape of the blade. The same must be, more or less, the case with repairs to an engine or machine. At the same time, such a consideration points to the absolute necessity for a correct history—or rather engine biography—being appended to each engine, pointing out where and what alterations and repairs have been made.

The Patent Museum, at South Kensington, only yet needs the "Novelty" to complete the trio of the engines which figured at the great Rainhill contest. It is not now known where the "Novelty" at present is, or, indeed, whether it is even still in existence. We believe that Mr. F. P. Smith is anxiously looking about for it, and we hope that he may be successful in his search. What lessons of the way in which "Fortune turns her wheel," may be read by a look at these old engines,—the progenitors of the apparatus, the use of which is stamping its impress on present life in so many direct and indirect ways. The two Stephensons are now dead, but their engine, which killed Mr. Huskisson, raised their fortunes above those of perhaps any other engineers of their time. Timothy Hackworth is now dead, but his works at Newcastle, like those of the Stephensons, are still flourishing. The Messrs. Braithwaite are now living, but their factory has been given up, and their partner of 1829, the Swedish engineer, Erichsen, is now building "Novelties," in the way of gunboats, for the Federals. In centuries hence, time will have thrown its halo of distance round these engineers, and their doings will be scanned with a kind of romantic interest. Let us hope that, in the course of the next century, the Government will have provided a decent building for the objects which represent such important interests, but which are now sheltered in the crowded and dark shed at South Kensington.

* See the London *Quarterly Review* for 1858, and the *Practical Mechanic's Journal* for 1850 and 1851.

OUR DOMESTIC FIRE-PLACES.*

On the strength of the aphorism of "every man to his trade," we may inquire who should be a more competent person to give us information about fire-places than a well-informed practical man who has manufactured thousands of them, and made an examination of their respective merits a life-long study? But it is so generally admitted that, as in love and war, all sorts of stratagems are fair in trade, that the public are apt to eye with reserve any production dealing with the writer's own wares, and to regard it as an oblique or disguised advertisement. We would, however, gainsay the application of this opinion to Mr. Edwards's work on "Our Domestic Fire-places," which, although it may answer the purpose of an ordinary trade-book, belongs to a higher order of things. Thus Mr. Edwards has not confined himself to a scale of praises upon the particular grates manufactured by his own firm, but has fairly weighed the merits of many that are patented by their inventors, and are therefore inaccessible to him as a source of profit. He gives a chronological account of the improvements made in fire-places in modern times, and particularly of the various contrivances that have been introduced to render fires smokeless,—the simple device known as "the *Builder's* fire" among others;—and beyond this, makes several useful recommendations, to the most striking of which we shall refer. Seventy-four illustrations of different forms of fire-places assist the reader very materially. And a supplementary chapter on the Patent law brings up the rear somewhat lamely, as a foreign contingent is apt to do.

Some of the principal fire-grate manufacturers have been required so frequently to remove old-fashioned fire-places and fire-dogs from country seats, when replacing them with new, that they have quaint collections accumulating in spare ware-rooms. A selection from these would be very curious. But Mr. Edwards takes up his subject at the period when the bad draught of the wide chimney-openings then in use, and the great waste of fuel they entailed, attracted the attention of Count Rumford. He remarks that exceedingly little progress has been made in the method of warming apartments by open fires since the Count published his essay, towards the close of the last century. The cause of this stagnation he attributes to two circumstances. In the first place, to the fact that the Count has had no successor of equal influence with the public; and, in the second, to the circumstance that builders deal principally with the great emporiums in Thames-street, who do not enter into details or trouble themselves about improvements, but continue to manufacture what they find to be saleable articles. The efforts of Count Rumford to improve our comforts should be gratefully acknowledged, if it were only for the single suggestion to use firebricks for the backs and sides of our fire-places instead of metal; but he has a

* "Our Domestic Fire-places: a Treatise on the economical Use of Fuel and the Prevention of Smoke. With Observations on the Patent Laws." By Frederick Edwards, jun. Second edition. London: Robert Hardwicke, 192, Piccadilly. 1865.

further claim upon us, which, perhaps, the next generation may allow; for Mr. Edwards believes that his *Roaster* for the use of the poor, which is an admirable contrivance, in which economy of fuel is practised to a very great extent, is likely yet to become a favourite with the industrial classes. We think of the Medes and Persians when we consider that the hundreds of thousands of grates distributed from Thames-street are all made of metal, and that their manufacturers altogether ignore the great economy and comfort of firebrick backs and sides, and the propriety or advantage of adapting the width of the bars to the size of the coals in general use. Many of our readers will, doubtless, remember that Count Rumford declared that metal of any kind is the very worst material it is possible to employ in the construction of fire-places; and that fire-stone and common bricks and mortar were the very best that he had been able to discover. In reality, the neat little metal registers now so generally inserted in every room in the rows of small houses growing up like garden-stuff upon the sites of suburban fields and market-gardens, are in fact monsters of extravagance. Mr. Edwards suggests that district surveyors should be empowered to condemn such grates whenever they find them in new houses!

Sylvester's patent introduced a new idea. The fire was placed nearly on a level with the floor, and each bar of the grate extended some distance into the room, so that it might conduct the heat there. King's patent and Stephens's patent next appealed to the public; they embraced the principle of directing the smoke to escape through an aperture at the back of the grate, and differed chiefly, from one another, in the mode of regulating the draught. Messrs. George Wright & Co. hold a patent which is also modelled on this construction, with the addition that the whole of the recessed arch extending from the point of junction with the front of the fireplace to the back is suspended on a hinge in addition to the door used in the former patents, so that the opening into the chimney can be enlarged at pleasure. Another novelty works out the principle enunciated by Cardinal de Polignac 150 years ago. It presents a chamber behind communicating with the external atmosphere, which, after being heated by its contact with the back of the grate, is admitted into the room through ornamental apertures in front. Mr. William Pierce made a great advance when he invented a little grate composed entirely of fire-lump except the bars. The grand problem, however, with regard to the domestic fire-place is the same as that over which furnace-builders ponder,—how can the fire be made to consume its own smoke? This has been endeavoured to be accomplished in various ways. Altogether forty-eight plans have been proposed to effect this piece of economy. These Mr. Edwards has divided as follows:—

1. Rotating grates, the first of which was invented by the American Dr. Franklin, and for which ten different patents have been taken out.

2. The use of a chamber contiguous to the fire, from which fuel can be introduced below or behind the burning fuel when required. (Six patentees have adopted this principle.)

3. The use of a contrivance, not forming part of the grate itself, to introduce coal at any time below the fire.

4. The use of a double fire. The fresh coal being introduced into the lower division is supposed to get its smoke consumed in the upper one.

5. For the prevention of smoke by a downward current for the products of combustion. (The first grate aiming at this result was constructed in 1680, and exhibited at St. Germains, near Paris.)

6. The use of a chamber to contain coal for a day's supply, a fire being made on the top of the fuel, which burns gradually away as it is exposed to the action of the air.

The grates, the use of which Mr. Taylor advocated in a paper printed in these columns, falls under the fifth of these divisions. Mr. Edwards, who deprecates the supposition of rivalship, finds several objections to them. It will be remembered that Mr. Taylor has two modes of dealing with the products of combustion. In one the heated products are intended to divide above the grate, and to pass off by separate channels to the chamber under the fire bars, and then to unite in an ascending flue into the chimney: in the other the heated products are carried down a single flue behind the grate, and are then intended to divide, and to pass by two ascending flues into the chimney. Mr. Edwards states that the first of these suggestions is a very unfortunate one, as it affords indubitable evidence of the scheme having been devised without practice or experiment; for no person familiar with the working of flues could have proposed to carry off the products of combustion from a register grate by opposite descending currents of air. The single descending flue he considers a happier thought. In this, he says, "the products of combustion are carried off as they should be in the same direction as that from which the air enters; but it must be remarked that after passing from the descending flue into the space below the fire-bars, they would scarcely ever be known to separate, as Mr. Taylor would lead us to suppose, but would pass at once to that flue in which the ascending current happened to be the strongest, which current would become thereby accelerated." It is our author's opinion, however, that descending flues are only applicable to a very limited number of cases; and that it would be utterly absurd to apply a grate with such an obstruction into an opening which communicated with a short chimney. He doubts, too, whether the smoke is consumed even in an otherwise successful application of Mr. Taylor's grate:—

"How is it possible for smoke to be consumed in passing at a short distance below the bottom bars of the grate? When and how does Mr. Taylor make oxygen combine with the hydrogen and carbon of the smoke so as to decompose the smoke? The space under the bars is simply a chamber which is by no means highly heated. There is no flame there whatever; for irrespective of the fact that under ordinary circumstances there could be no downward current between the bars, we must consider that coal in a full state of ignition, as coal generally is at the bottom of a grate, has lost most of its hydrogen, and is therefore flameless."

Dr. Arnott's popular grate belongs to the sixth division of inventions aiming at the consumption of smoke. It was based upon the patent of Mr. John Cutler, the principal feature in which was a movable bottom, made to rise or fall by means of chains and wheels worked by a handle. When lighted in the morning the bottom was to be lowered, the chamber filled with coal, and a fire made on the top; and when fresh fuel was wanted, all that was required was to raise the bottom by winding up the chains attached to it. This plan was patented in 1815. Thirty years afterwards Mr. George Tillot took out a patent for an improvement upon this device. He added a contrivance by which fresh fuel could be put into the bottom chamber when the supply was exhausted. He made a little recess at the top of the grate, into which the remains of the ignited fuel and the front fire-bars could be pushed while the process of lowering the bottom and refilling the chamber went on. When this was accomplished, the fire-bars were restored to their place, and the ignited fuel drawn forward on to the top of the fresh supply. Mr. Tillot proposed also to raise the bottom of the chamber by springs. Eight years later Dr. Arnott stepped into the arena with an additional contrivance and some simplifications. He provided a similar chamber for the fuel, but made a point of preventing air entering it, and provided the effective instrument, the lever, as the means of raising the movable bottom. The upper part of his fire-place he contracted into a metal hood, in which he placed a damper, to regulate the draught. Two firms manufactured the doctor's invention,—that of which Mr. Edwards is a member, and the Messrs. Bailey.

Dr. Arnott may be said to have been the successor of Count Rumford as a reformer of the fireside. He read a paper upon the subject of his improvement to the Society of Arts, in 1854, which was very well received. The *Times* and *Quarterly Review* approved of the new suggestions; and orders began to flow in. Mr. Edwards does not state the number manufactured by the Messrs. Bailey, which, by-the-bye, presented some small differences in the details from those his own firm executed; but from the first sample, despatched to the present Archdeacon of Dorset, in 1854, to the end of the year 1863, Messrs. Edwards had supplied 2,517. The advantages expected from the mode in which the fuel was treated were, that there would be no smoke after the coal was properly ignited, and scarcely any soot; that the fire, and, consequently, the heat of the room, could be maintained at a certain point with less variation; and that it could be left from five to eight hours without attention. To ascertain whether these results were actually obtained, Mr. Edwards took the trouble to address circulars to about 650 persons to whom his firm had supplied these grates, omitting wholesale houses dealing in grates, exporters, and builders, as they were not expected to have used them. 156 persons replied. Of these, 83 wrote favourably of them, and raised no objection; 30 wrote favourably, but mentioned certain objections; 21 passed neutral opinions; and 22 condemned them.

The pith of Mr. Edwards's experience is to be found in his deductions and recommendations. Allowing that our insular traditions are not likely to be superseded by the acceptation of any other mode of heating our habitations than open fires, and that our latitude and longitude require that the majority of these should burn from eight to sixteen hours a day for, at least, seven or eight months of the year, he compresses into seven heads, the gist of the national requirement. 1. What is the best form for a grate? 2. Of what materials should it be composed? 3. What should be the general arrangements of the fire receptacle? 4. What provision should be made for checking the escape of the heated air? 5. How should air be supplied to the fire? 6. How are the heated products escaping into the chimney to be utilized? 7. How should coal be supplied to the fire? With regard to form, the grates that are provided with sloping surfaces from the fire-bricks to the metal fronts, radiate or reflect, according to their material, the most heat. The square forms expose most heated surface, and are on that account to be preferred to the more popular circular form. On the subject of materials, Mr. Edwards says,—"It is much to be desired that the use of tiles in a fireplace should become very largely extended, for few persons have an idea how cheerfully, elegantly, cheaply, and usefully their fireplaces can be arranged with the aid of a few tiles, some fire-bricks, and a little ironwork, instead of the usual cheerless black grate." The most economical receptacle for the fuel is that of a dish-shaped fire-brick below the fire, and fire-brick back and sides extending to the chimney-opening. A few small holes are perforated, tapering downwards, at the bottom of these fire-brick basins for the purpose of allowing a little air to enter the fire on certain occasions. (Should, however, the fire be lighted from the top, as in the *Builder's* fire, these holes might be dispensed with.) Our author makes a useful suggestion when he insists that every ordinary register stove should be fitted with the means of regulating the size of the opening into the chimney. As most of them are already provided with racks on which their doors can recline at any angle, all that is wanted is a communication from the outside with the door. There should be a handle outside the fireplace, by which any one could adjust the door without soiling their hands. When he comes to the question of supply of air, the author admits that in a common way there is too large a supply of it from below the grate, and that the sheet of iron over the bottom, prescribed by the *Builder*, is one of the best antidotes to the waste arising from a too rapid combustion that can be devised. He thinks, however, that an ash-pan in the same place would answer the same purpose and do double duty. Although it may be against the manufacturing interest to recommend so simple and costless a contrivance, Mr. Edwards candidly admits that the mode we have so frequently advocated is very efficacious and economical;—that "it will burn with great steadiness, give considerable heat, and require no attention." After this recommendation, we find him poaching upon our manor, counting probably upon not being ordered off on the ground of extending the utility he acknowledges our plan to possess. He says that the system can be so elaborated that the fire need not be replenished for *a whole day*. This is to be done by making an extra depth for the bottom layers of coal by means of an extra bar or two added to the top; and to provide against the ignition of the mass a sheet of iron is to be suspended by two hooks before the lower bars. A still more elaborate method, makes this metal cover or air excluder to the lower front of the fire, to be suspended by chains in grooves, at each side of the grate, instead of merely hooking on to the bars or fitting on to hooks projecting from the sides. Mr. Edwards says, assuming that the objection advanced to Dr. Arnott's plan of want of simplicity is disposed of by the above propositions, that "the cover or blind to shield the coal can be as ornamental as any one can wish; the fire-bars can be substituted by ornamental lattice-work of the required depth, and a polished steel ash-pan, such as is used to an ordinary grate, can improve the appearance of the hearth and receive any fine dust falling in front." We must sum up these elaborations by repeating that our recommendation of this mode of dealing with a fire is based upon its economy, cleanliness,

readiness, and efficacy, more than upon its capabilities for ornamentation.

Mr. Edwards finds a great many faults with the Patent Laws, and, as we have indicated, devotes a long chapter to their blemishes. He first stumbled upon his grievance in visiting the library of the Patent Office in Southampton-buildings, for the purpose of ascertaining the merits of any suggestions for improvements in grates which might have been patented but not brought into public notice. It was certainly an aggravating circumstance that for one patent, or application for protection by patent, of which he had heard, there were not less than ten that were new to him; and, perhaps, still more so, that the atmosphere of the library,—or, as he names it, *the long passage*, in which his investigations were conducted, was such that, though the fortunate possessor of an excellent constitution, he was unable to remain in it for two hours without discomfort; but these facts scarcely warrant the opinion he has formed of the working of the Patent Laws. But, although we do not agree with his extreme views, we can admire the continuance of purpose that prompted him to examine three hundred of the specifications relating to grates, and appreciate the industry with which he collected every particle of information relating to his subject that was of value. The total number of patents connected with fire-places, stoves, &c., down to 1852, when the Patent Law Amendment Act came into operation, was 169: the number of patents, or of cases of provisional protection only, from that date till the last day of December, 1863, was 348, making a total of 517. The year 1862 was the most prolific in that period; as many as thirty-five applications for the various terms of protection having been made for new ideas connected with the improvement of our firesides. In the following year they fell to thirty-one. Mr. Edwards made a digest with a view to ascertain in how many cases patentees were able or willing to extend their period of protection. Of the 183 applications made up to the year 1857, inclusively, 63 received provisional protection only; 87 obtained powers for three years, which they did not renew; 26 obtained protection for seven years; and 7 only for the full term of fourteen years. He notes, too, as a significant fact, that the inventors of the best improvements, such as Count Rumford, Mr. Stephens, and Dr. Arnott, gave their discoveries to the public; and that, while a French nobleman and a butler may be found among the patentees, the names of well-known London dealers seldom or never occur. He concludes by suggesting that the system of protection by patent should be swept away, and a permanent museum of industrial art established, as a better means of bringing inventors and their suggestions before the public. Mr. Edwards is, doubtless, *great* upon fire-places; but he is lost in the Patent Offices.

One consequence of taking up the history of our fireplaces at so late a period, is the fact that we appear, upon the face of it, never to have had any other mode of heating our houses; whereas we know that, during the four hundred years of the Roman occupation, buildings were warmed by hypocausts. Supply this link in the experience of man, and a new train of thought arises. The modern Italians have gradually modified the ancient Roman plan into a system of zigzagging their flues to such an extent that they serve as heating apparatus to the rooms they skirt. Is not this a rational mode of utilizing the heat we waste?

THE DOCKS AND WAREHOUSES AT MARSEILLES.

INSTITUTION OF CIVIL ENGINEERS.

ON January 24th, Mr. John Fowler, V.P., in the chair, the paper read was "Account of the Docks and Warehouses at Marseilles," by Mr. T. Hawthorn.

It was stated that the port of Marseilles comprised five docks in actual use, and one in course of execution. The old dock, or old port as it was generally termed, constructed about the time of Louis XV., was formed out of an inlet of the sea. It was 1,100 yards in length, with a mean breadth of 120 yards, and near the entrance the depth of water was from 21 ft. to 22 ft. The dock de la Joliette, the first constructed basin of the new port, was 500 mètres in length by 380 mètres in width. The dock du Lazaret, which served exclusively for customs purposes, came next; and then the dock d'Arene, succeeded by the Napoléon dock, 380 mètres in length by 300 mètres in width, recently completed by the State, who were at present engaged in the construction of the dock Impériale, as well as graving docks, which would be executed to the level of the quays by the Ponts et Chaussées, and then be handed over to the "Cie. des Docks et Entrepôts." All these basins were formed by constructing moles in the sea, a pier, or breakwater, parallel to the shore, constituting the seaward side of the enclosure. The earthwork for the moles of the Joliette and Lazaret, as well as for filling in the space upon which the magazines and warehouses were built, was taken, for the most part, from a hill immediately to the east of the docks. This hill, of nearly 100 ft. in height, might literally be said to have been thrown into the sea; two million cubic mètres of "deblais" having been thus employed. The mole Arene was formed with "deblais" from the Rue Impériale, a new street cut through the old town to the level of the new town, which involved the excavation of 1,200,000 cubic mètres. Previously to the filling in of the Lazaret, excavations to the depth of from 8 to 10 mètres were made in some places, to remove a mass of slimy earth, that had accumulated at that part for many years, from the residue of old soap works. This earth was so impregnated with a green coloured matter, that obnoxious gases were frequently given off, producing illness among the labourers.

In the construction of the pier and breakwater, an embankment was first formed of hard calcareous stone, mostly taken in barges from the islands opposite the port. This stone was sorted in classes thus: rubble weighing from 20 lb. to 250 lb. each piece, first class from 250 lb. to 1 ton 2 cwt. each; second class, from 1 ton 2 cwt. to 3 tons 15 cwt. each; and third class, from 3 tons 15 cwt. and upwards. The smallest material was used for the core, or hearting, of the embankment, the larger pieces being successively added. This embankment was levelled * at a height of 2 mètres (6 ft. 7 in.) above low water, the surface being 7 mètres in width, and the slopes having an inclination of 1½ to 1 in height. At a depth of 8 mètres under low water, the width of the embankment was increased to 7·34 mètres, horizontally towards the sea, in order to receive the large concrete blocks, placed on it promiscuously to break the force of the sea. The artificial blocks had a width of 10 mètres at the level of low water, and they attained a mean height of 3·8 mètres above the same level. On the inside of the pier, a quay, 30 mètres in width, was formed of natural blocks, with a wall in front, the latter having its foundations 6 mètres below the water-line. The embankment had a slope towards the dock of 2 base to 1 in height, and as its formation progressed, it was from time to time solidified, by placing on it artificial blocks, in tiers one above another, by means of a floating crane, or derrick. These blocks were generally allowed to remain about three months.

It having been ascertained by experiment, that blocks weighing 20 tons each, and measuring 10 cubic mètres, could not be moved by the most violent sea in the Mediterranean, artificial blocks of concrete were made of an average weight of 23 tons; their dimensions being 2·4 mètres long, by 2 mètres wide, and 1·5 mètre deep. These blocks were composed of two parts of hard, broken limestone, to one part of cement; the cement consisting of five parts of sand to one of lime. These materials were mixed in portable iron cylinders, made to rotate by means of a belt connected at pleasure with a steam-engine, which also drove the stones for mixing the cement. After the concrete had been well worked, the mixture in the cylinders was emptied into wooden moulds, which could be detached from the blocks. The moulds were so constructed as to form a groove at each end of the blocks, for facilitating the lifting and setting of them. The contents of each cylinder were beaten down by two men, an operation which occupied half a day for each block. The moulds were allowed to remain for at least three days before the cases were removed; but the blocks were not considered to have attained sufficient solidity and hardness, for those that were to be thrown promiscuously into the sea until after a lapse of three months, and for those that were to be employed in forming the foundations of the piers and quays until after a period of six months. The blocks attained, in course of time, a hardness almost equal to that of stone; those first used, about sixteen years back, being very little worn by the action of the waves. The cost of the blocks was 12s. 8d. per cubic mètre, or, including setting and other incidental expenses, 15s. 10d. per cubic mètre. The entire cost of the breakwater had amounted to from 290*l.* to 310*l.* per lineal mètre.

* The level of the Mediterranean varied at Marseilles about 18 in., according to wind and other influences.

In the construction of the quay-walls of the docks Lazaret, Arene, and Napoléon, the system of building on artificial blocks, somewhat similar to the inside of the pier, was adopted. At 6 mètres under the level of low water an embankment was formed of second and third class stones, having a base of from 8 to 9 mètres in width, and an inclination at the sides of 1 to 2. Upon this embankment, and up to the level of the water, four rows of artificial blocks were placed longitudinally side by side, making a total height of 6 mètres, with a width on the top of 3·4 metres. Two rows of blocks were usually placed on these to consolidate the embankment, and were allowed to remain for about six months. When they were removed, a masonry wall was built up to the level of the quay. At the back of this wall there were other artificial blocks, from the upper side of which a further embankment of stones was formed, having an inclination of 1 to 2. The quays of the Arene and Napoléon docks were 2·4 mètres, and those of the Lazaret dock 3·4 mètres, above the water-line. In several places the embankment beneath the artificial blocks had moved, generally slipping forward, and causing the artificial blocks, as well as the quay walls resting on them, to incline over towards the dock. This usually arose from an insufficient time having been allowed for consolidation, and most frequently occurred in the quays or the moles, where it had caused some of the walls to yield. Owing to the instability of the quay walls, and from the nature of the embankment behind them, the quay cranes simply rested on platforms of heavy timbers, which had sufficient base to insure stability during the "slewing" of the jibs. The entire length of the quays, at present constructed, belonging to the Dock Company, was 2,849 mètres. The cost of the quays above the embankment, that was of the quay walls with the artificial blocks supporting them, was 24*l.* per lineal mètre.

Sheds 14 and 10 mètres in width, extended completely round the dock du Lazaret. These sheds were covered with a simple roofing of double T iron, the rafters for supporting the tiles being also of iron, of an A section. The side towards the dock was closed by sliding or rolling doors of corrugated zinc, the roof resting on this side on cast-iron columns, and on the other on the walls of the magazines. These magazines were of one story only at present, and were constructed of rubble masonry, with dressed piers and quoins, and wrought-iron roofing, with vaults in brickwork. The amount of covered space, including the floors, was 67,132 square mètres. The flooring for all the magazines and sheds was composed of a layer of asphalte half an inch in thickness, costing 2 francs per square mètre; but including the levelling of the ground and the bed of cement below, the cost was about 6 francs per square mètre.

The bonded warehouses, or "entrepôt commercial," formed one block of buildings, to which were attached the company's offices. Two lines of railway, and a public thoroughfare which ran parallel to it, separated these buildings from the Dock du Lazaret. On the east side were sidings from the Paris, Lyons, and Mediterranean Railway, a junction with this line having been made by means of an incline and a tunnel under the town. The length of these warehouses was 365 mètres (1,200 ft.), with a breadth of 37.5 mètres, and a height of 35·7 mètres. The offices were of the same breadth, with a length of 37·6 mètres. The warehouses were divided into four quarters, each containing an interior court with two doorways. There were six stories above the ground floor, with vaults below; the whole having been constructed in stone and iron, the concession requiring that all the materials should be fire-proof. The masonry was for the most part a better class of irregular rubble; but the piers, arches, quoins, windows, and ornamental work, were of dressed ashlar. The cost of the several kinds of masonry and brickwork per cubic mètre was, hard limestone dressed and built in place, 4*l.*; less hard quality, 3*l.* 4s.; soft calcareous stone from Miramas, 2*l.* 2s.; rubble, 12s. 6d.; and brickwork, whether of solid or of hollow bricks, 2*l.* 8s. The thickness of the

walls was 1·25 mètre at the foundations, 1·08 mètre at the ground floor, and diminished gradually to 0·58 mètre at the sixth story. The ground floor was supported by massive stone pillars and vaulting, while the other floors rested on cast-iron columns. Each quarter was provided with two hydraulic hoists, capable of lifting 1½ ton each, and with two sets of lowering apparatus, the cradle going up empty, by means of a counter-weight, while the extra charge brought it down again. All these warehouses were constructed without the aid of scaffolding, by means of three travelling cranes, two on one side, and one on the other, of the buildings. These cranes consisted simply of a jib 28 mètres in length, suspended a little below its centre; the extreme load lifted at one time was 2½ tons, and per day, by each crane, 150 tons. There were 14,136 cubic mètres of masonry in these warehouses, and it had cost 3,000,000 francs (120,000*l.*), exclusive of the foundations, the latter having cost 203,000 francs. All the doors and window-frames were of wrought-iron, 30*l.* per ton having been paid for the former, or in all, for the doors alone, 4,800*l.*

The floors for each story were composed of wrought-iron double T girders ½ a mètre in depth, 4·53 mètres in length, and weighing 145 kilos. per mètre. These rested on cast-iron hollow columns varying in section at each story, according to the load. The junction of two columns with the wrought-iron girders was made in such a way as to allow of the expansion of the girders taking place. One column simply rested on the top of the other, the two ends being turned in a lathe, while the girders rested on the lower flange of the upper column, the attachment being by bolts. The columns were all cast vertical, were 4 mètres in height, and were tested to support a vertical load equal to 8 kilos. per millimètre of section. The wrought-iron girders were subjected to a tensional force equal to 12 kilos. per millimètre of section. The cost per ton of the girders had been 22*l.*; of the tie-rods and other pieces of wrought-iron, 500 francs; of the columns and pedestals, 300 francs; and of ordinary castings, 273 francs. The vaulting between the girders was built of hollow bricks, 6 in. deep, costing 10 francs per square mètre complete. The floors were all constructed to carry 2 tons per square mètre, but it was believed that they would bear much more with safety.

The wrought-iron roofing of the warehouses was then described in detail. The girders were composed of two angle-irons at the top, and two at the bottom of the section, separated by strips of flat iron, forming a sort of lattice web. The girders were free to move in the direction of their length, resting simply on a cast-iron shoe embedded in the wall. They were 4 mètres apart from centre to centre, and were separated at the crown by similar girders. The tiles were supported by iron of an A section, 8 centimètres in depth, and galvanised. It was calculated that this roof would sustain 4 cwt. per square mètre. The vaulting between the girders was of hollow bricks, similar to those used for the floors, but much lighter. The vaulting cost, including all expenses, 6s. 8d. per square mètre. The quantity of cast and wrought iron was 340 tons, and its mean cost had been 24*l.* per ton.

The total cost of these bonded warehouses, comprising machinery, hydraulic pipes, &c., had been half a million of pounds sterling.

SOCIETY OF FEMALE ARTISTS.

THE ladies, who, for the last few seasons past, have contributed an agreeable item to the picture exhibitions of the metropolis, have just opened their well-lighted little Gallery, 48, Pall-mall, and now invite inspection. Perhaps to those who were most sanguine in their expectations that some such society would speedily assume an importance and position, significant, in some degree, of the great amount of artistic skill subsisting amongst the female members of the profession who have lately made themselves best known, the collection of pictures and drawings submitted on this occasion will bring surprise and disappointment, and they will deplore the lost opportunity of achieving success for the institution where the means of it would appear to be so easily accessible. Fruit and flowers assert a too preponderating monopoly of attention above all else, though there are certainly some specimens that justify the predilection for their selection; and landscape finds its appreciators in many delineators of its more easy phases; but those of the sisterhood upon whom it would mainly depend for evidence of any such association as a Society of Female Artists being needful or advisable, either lend too little of their assistance to be of material benefit, or, worse still, appear to have no concern at all in the matter. The consequence of this is, that there is little to raise it above an ordinary exposition of amateur and student progress, with very insufficient pretensions to the title it assumes.

Compositions, illustrative of even the simplest incidents, are of the rarest occurrence; and this is very remarkable in these picture-book times; and even figure-drawings, judging by the few who have attempted them, either find little favour, or offer difficulties less surmountable than the admirers of Mrs. E. M. Ward, Miss Emily Osborn, Mrs. D. Murray, the clever Miss Claxtons, Miss E. Edwards, and others conspicuous by their absence, would wish to believe, if they look for any extension of the list. An exception must be made for Miss Kate Swift, whose couple of domestic episodes (177), "Two Heads are better than One," and (186) "A Stitch in Time saves Nine," are worthy of better company; and, saving Mrs. Ward's two mites of mortality (182), "The Young Archer," and (188) "Beatrice Mary Florence," a real live baby, are the best representations of humanity present: but it may be observed of this young lady, that in the acquirement of greater finish, some sacrifice of the naturalness and force that belonged to her earlier performances is to be regretted.

The initials E. V. B. are so inseparable from those charmingly poetical creations that won for them a notoriety some time since, under the title of "Child's Play," and known as having been repeatedly connected with similarly conceived illustrations, that it is difficult to identify such emanations as (221) "A Dream," (225) "Arcadia," and (235) "Fragments," with their more valuable precursors, wherein the aim and effect were so different. Nature and probability are ignored in these, where they had formerly been the basis for ideal treatment; and an absorbing faith in Giotto and Angelico, with their conventional usage of form and symbols, has replaced a far better object of devotion.

There are many very pretty and prettily-executed studies of heads, such as Miss Adelaide Burgess's (28) "French Flower Girl," and (38) "Grimm's Fairy Tales," present, with (53) "Kiss Little Sister," by Miss Agnes Bouvier; (77) "A Young Knight," who does not look as if he meant more harm than he apparently could do, by Miss Margaret Gillies, and not half so mischevious as (78) "A Little Gleaner," by Mrs. Backhouse; and some nice landscapes by Miss S. S. Warren; for instance (72), "Path through the Woods;" and by others equally good. But the strength of the exhibition is to be found in a less ambitious employment. Fruit and flowers in their irresistible attractiveness of brilliant hues and graceful curves and wreaths, offer very fascinating inducements to the painter, whether male or female; but, in virtue of their analogy, they are more appropriately to be considered properties for feminine study: so that it may be, after all, unreasonable to complain they should be here the staple commodity of such a locality.

For the closeness with which the qualities of "fruit" can be imitated there are specimens by Miss Helen Coleman that would satisfy the most exacting taste—or rather anything but *taste*: (230) "Grapes and an Apple" are as real-looking as things of the kind can be that are not intended to be eaten; and still more exquisite is her study of a cluster of hazel-nuts (236) "From Nature." Another excellent fruit-piece (not included in the catalogue) is furnished by Mrs. Withers; and for flower-painting, even amongst so much that is good, to Miss Emily Lane's beautifully-drawn (222) "Iris" most will award the palm, even though Miss Lane, an elder sister it may be presumed, shows to such great advantage a remarkably facile method of imitating the crispness and pure colour throughout some eight or ten cullings from a varied selection of blossoms. Miss Emma Walter, combining "Fruit and Flowers" (47), is more elaborate in her delineations, securing for them a claim to be considered as pictures by her taste in grouping them. A curiously literal copy of one of Mulready's life-studies, by Miss C. James (148), and the bronzes of bulls and sheep—too good to be agreeable or adapted for general ornaments—after models by Rosa Bonheur, will be certain to attract attention.

DESTRUCTION OF THE SURREY THEATRE.

SOME observations in our last on the fire-risk attending theatres as at present conducted, and more especially under existing requirements, have been further emphasized by the complete destruction by fire of the Surrey Theatre, which unfortunate occurrence took place on Monday night last. The natural end of every English theatre appears to be a fire: it is simply a question of time, and, that being the case, how urgent is the necessity that all managers should look to the adoption of the amplest precautions and the means of ready and safe egress from their houses. The first Opera-house built in London, by Novosielski, in the Haymarket, was burnt down in 1789; Drury-lane was burnt down in 1672 and 1809; Covent Garden in 1808, and again a few years ago; the Olympic in 1849; Astley's in 1794, 1803, and 1841; and so we might go on through the provinces and right away to the Scottish capital. This very Surrey, first opened in 1782, in opposition to old Astley, and re-arranged interiorly in 1799, was burnt down in 1805. The theatre just now destroyed was opened on Easter Monday in the following year, having been rebuilt under the direction of Cabanel. Elliston was once its manager; and here Buckstone first appeared.

The fire on Monday night appears to have broken out in the roof over the pit, and was observed from the stage towards the end of the pantomime. It is supposed by some about the theatre that the gas by which the chandelier was lighted, having been lowered for due effect to the transformation-scene, was turned on again with too great power, and the upward draught carried the heat through the aperture in the ceiling, composed of thin boards and oil-painted canvas, and set light to the edges, from which the fire communicated to the workshops. It is certain that it was through this aperture the fire was first perceived by the performers on the stage and the audience in the pit. Mr. Hinckley, the gas engineer, who went up immediately after it was seen, got to within a few feet of the carpenters' shops, which run over the roof of the pit, separated by a second-floor. He then saw a large quantity of shavings in a blaze, and the flames were rushing round the workshops with the greatest fury. Scenery was in preparation, it seems, for a new piece, which accounts for the quantity of shavings. However, nothing certain is yet known, and it is to be hoped that a careful inquiry will be made. One thing we may say with certainty, that in no new theatre should any portion of the roof be used for stores or work. Spontaneous combustion, where oiled tow and rags are lying about with shavings, may occur under ordinary circumstances; but in an atmosphere overheated by the chandelier, as was necessarily the case in the present instance, and is so in some other theatres, it is strange if it do not oftener occur than we hear of it.

Great praise is due to those members of the company who, by their presence of mind and discretion, so communicated with the audience as to prevent a panic, and enable all to leave the theatre without any injury, and who also assisted most bravely and efficiently in placing the ladies and children of the company out of danger.

With the exception of a heap of charred timbers and a few bent iron ties, nothing remains but some of the enclosing walls. The bond-timber in the walls is all burnt out, and the evil of its use made evident. The site is an ample one, and will admit of the erection of a fine theatre. Let us hope the present and previous disaster may lead to the adoption of the arrangements best calculated to prevent its recurrence.

LADIES' SANITARY ASSOCIATION.

WE want a little aid for this valuable association in a special direction. To try and lessen a little the "ignorance that is not bliss," the committee devised a course of lectures giving simple domestic sanitary information, and engaged lecturers to deliver them in various Mechanics' Institutions, working men's clubs, and similar places. One treats of the "Essentials of a healthy and comfortable home, as exemplified by some of the improved dwellings recently provided in London;—the external gallery system;—fireproof construction;—suburban cottages. It gives an insight into the relative advantages and best mode of using various building materials; fittings and furniture; the

mechanism of locks and other household contrivances; the manufacture and respective qualities of different kinds of hardware, earthenware, glass, and other domestic articles." A second teaches "Personal Hygiene;—means for promoting the proper development of the frame, and for the preservation of health in infants, children, and adults; means for the avoidance or relief of common infirmities, especially those of the eyes; means of comfort for the sick; correct notions concerning the use of household remedies and the abuse of empiric medicines," and so on.

The course of six lectures has been given in nine places, besides a little skirmishing elsewhere. The lectures have succeeded beyond expectations, and the people have been much pleased, and we hear instructed, by them. The expense, however, has also far exceeded the committee's expectations; and what we wish is, that some of our readers interested in the subject will contribute to the lecture fund. It has been suggested that the course should be given (if permission can be obtained) in the eight Training Colleges in and near London. This seems a very good suggestion, as a means of teaching those who are to rear little England; but the expense would amount to about 50*l.*, and the committee could not face it without some help. This help, therefore, we again invite.

We are glad to hear of the establishment of branch associations. At Leeds, last week, one was formed. A committee of six ladies was appointed to transact the business of the branch association, and a sum out of the funds in hand was voted for a supply of sanitary tracts and publications from the parent society. These tracts will be distributed by the members and others forthwith, it being the feeling of the meeting that, for the present, it would be sufficient to supplement the operations of the branch association to the numerous and existing charitable societies and agencies; and that it was desirable to begin by spreading sound sanitary information amongst the working and poorer classes. It would be well if the gentlemen of Leeds united also. Efforts are needed there, as we have before now said.*

* Some of the thinking people of Leeds are becoming convinced, that if they had attended to our exposition of the state of their town, and our advice given, some years ago, they would now be the better for it. The *Leeds Mercury*, in an article on this subject, says:—"It is a melancholy, indeed, an appalling, fact, that the decay of man in Leeds is actually more rapid than in any of the great towns of the kingdom, with two exceptions. London, with all its bad parts, Birmingham and Bristol, neither of them models of sanitary arrangement, are all far below this borough in the rate of mortality." "There are 2,000 unnecessary deaths happening in the borough every year, every one of which might have been prevented if our town had been built with due regard to sanitary conditions; multitudes of which might have been prevented if the town council had resolved to deal vigorously with the matter only a few years ago, the recurrence of which may still be prevented if even now the disgraceful lethargy stigmatised by the Registrar-General can be removed, and a healthy, manly, vigorous spirit can be breathed into the hearts of the leading men of the town."

FIRE EXTINCTION AND PREVENTION.

It seems but a useless task to offer suggestions and improvements to the great intellectual and non-intellectual organization—"the public." Numerous useful and practical ideas are continually being published upon various subjects; which are read and approved, and then pass into an honourable oblivion. Such has been the especial fate of "fire prevention" remedies; yet absurd as it may seem to expect those having the power and opportunity to construct and employ such auxiliaries, I cannot refrain from adding a few more hints to those already before the world, in the hope that there may be, sooner or later, a more active interest taken in a subject of such imminent importance as "fire extinction" and life preservation.

At the meeting of the National Association for the Promotion of Science, held in 1861, Mr. Bateman gave important testimony on the subject of fire extinction. He showed that Manchester, although second in rank and wealth to London, was far ahead of the latter as to the means afforded for preserving life and property from fire. In Manchester, within reach of nearly every block of valuable buildings and the neighbourhood, there were from two to three sources of water supply, and ten or twelve fire-cocks within a hundred yards. He entered at length into the use of stand-pipes, and stated that, "as a general rule, they had been found sufficient without the use of fire engines. The highest mills in Manchester were from 40 ft. to 60 ft. above the ground, and experiments had shown that at the low pressure the highest stand-pipes would throw 90 ft." This is equal, or very nearly so, to the capability of a fire-engine. He further stated, it had been proved, that with large engines requiring thirty men to work them, with constant relays, no advantage was gained over the stand-pipes, which required but two men to work them. He concluded with the following rational observations and suggestions,—"If once the flames had obtained a hold of the building it was utterly impossible to extinguish it; and all the water poured on it became converted into steam, and thus increased the draught, and only served to add fury to the flames. All the fire-brigade could do then was to prevent the fire from spreading to the surrounding buildings. And yet if a bucket of water had been applied at the right time, the fire might have been prevented. Therefore, what ought to be done was, that in every district a fireman should be stationed within a distance of not more than 100 yards from the scene of any possible fire. Manchester was divided into seventeen districts, in each of which districts a waterman was stationed, whose duty it was to make himself master of his own district." All these men should be enrolled and trained in the fire-brigade. Mr. Bateman further suggested that telegraphic communication should exist between all such districts and the central stations; and that there would be no difficulty or great expense in carrying out such an arrangement. Such a rational system would probably prove in the end a great economy of capital.

Mr. W. Smith, another member of the before-named association present, conceived that water should be thrown as much as possible in dashes, and in a body. Mr. Adamson suggested that instead of water being thrown so much to the top of a burning building, it should be thrown in at the bottom, so that the steam therefrom would assist in extinguishing the flames above. These various suggestions appear to be worth the most attentive consideration.

The injection of steam in place of water would, I conceive, prove a greatly superior agent in the reduction of fire. Steam would permeate through a very much larger amount of space at each injection than water, which only falls on a circumscribed extent of surface; besides, it would, by its ascension, attack the flame which, ever rising higher and higher, and above the glowing mass or basis of a fire, is its most destructive constituent.

The value of "stand-cocks" was especially shown at a fire which broke out in a pile of bonded warehouses in Lower Thames-street in 1861. The Custom House stand-cock, being close at hand, "was the first machine at work, and did a marvellous amount of good in staying the ravages of the fire." So says the newspaper report of the catastrophe.

The insufficient provision of water is exemplified by an incendiary fire which took place at a farm, near Folkestone, where the supply could only be obtained from a well, so that nothing could be done to extinguish the flames. The remedy for this would seem to be the erection of more or less capacious tanks at every isolated farmstead, as well also every small village or town, at the cost of individuals, or of the parish in which a house may be contained.

It has been suggested, and very sensibly, that the police (or parochial) authorities, might render good service, by having long and strong yet light ladders placed within easy access upon every beat in the metropolis. These being secured by padlocks, a key to which each policeman should have, and who, with little delay, could have them brought to any house on fire, and elevated to any window where the endangered inmates presented themselves. Instances have occurred where, a builder's ladder being at hand, life has been saved by such immediate help before any "fire-escape" could possibly arrive.

"Stand-cocks" should be fixed at regulated distances, in every street throughout a city or town; while large warehouses and all public buildings should have several or many placed round their areage,—these again being increased when the contents of a building were more than usually inflammable. It would even be a wise precaution for the occupants of shops, &c., to provide themselves, independently, with such efficient yet simple auxiliaries, either at the rear or in front of their premises. They could be constructed so as to appear a mere and ornamental pillar, capable of being readily unscrewed in part, and a hose affixed thereto.

An "engine" can rarely arrive under half an hour in the metropolis—often requiring a much longer interval to elapse. By the use of "stand-cocks" a fire might be put out in the space of a few minutes after its commencement.*

The late Mr. Braidwood held in such great estimation the common hand-pumps as a means of fire extinction, that no engine was allowed to leave its station without one. A considerable number of fires have been extinguished by the brigade using hand-pumps only. These simple machines have been introduced at the Theatre Royal Drury-lane, and consist merely of a hand-pump worked in a bucket of water. The erection of "stand-cocks" in various and many parts of a house would be still more useful. The hose being affixed to these, they could, by having them of ample length, reach to and throw a copious stream of water over and into every part and corner of a theatre.

Our present arrangements for supplying water for extinguishing fires are very defective. At a coroner's inquest, held September 7th, 1863, upon the bodies of some children destroyed at a fire in the Soho district, the coroner inquired whether the water could not be turned on at any plug; to which Mr. Gatehouse, the engineer of the London Fire Brigade, replied, that it could only be turned on at particular plugs in the first instance. The coroner again asked,—"And do not the firemen know where these main-plugs are?" To which the answer was, "No; there are so many plugs, that whether the enginemen may know the situation of the particular plug which turns on the water in the street main is quite a matter of chance." Without doubt this is an evil state of things, which needs a speedy rectification.

At a fire which took place in August, 1862, at a tobacconist's, in the Old Kent-road, the inmates were aroused by a parrot, belonging to the occupier, crying out, "Master, master!" The residents were in all probability saved by the exclamation of "poor Poll," who was unfortunately burnt to death.

I believe that by a more judicious and simple system of house construction a fire might always be confined to the one room or warehouse in which it originated. Here are my suggestions to effect this desirable result. The inside of each room-door is to be plated with iron, which could be cast, and present an even more ornamental appearance than the woodwork now does. Every door should have a "box spring" attached to it, so that it would not depend upon the thoughtfulness of any occupant who might, through alarm or other cause, vacate an apartment. Instead of the primitive and (as I conceive) poor invention of plaster ceilings, let there be cast-iron plates riveted to the joists and together—similar plates being affixed to "wainscots" and "skirting-boards." These alterations or additions in the materials used would, there is little (if any) doubt, prove perfectly fire preventive, so far as relates to its extension beyond the room it first originated in. Yet mankind is so slow to adopt rational means, especially if they be simple in character; remembering, too, the all-powerful influence of interest and its opposition to progress, that it may be long before such practical and economical improvements will be acted upon.

Much, if not the chief part, of our articles of furniture might be constructed or prepared so as to be fire-proof. This could be effected either by making them of iron or other metal, and bronzing, painting, gilding, &c. Or wood might be steeped in some anti-combustible chemical preparations,—such as sulphate of ammonia, and many others.

Carbonic acid gas extinguishes fire immediately. Might not this be generated in portable or ordinary fire-engines, and impelled into the front or back of a house or building through openings permanently made therein, and ordinarily kept plugged, high up in the doors or walls of buildings.

The burning of a ship, when occurring in the hold from the want of ventilation and due egress of the combustible gaseous matter generated, might, we believe, be rendered impossible. To effect this it is now suggested that a temporary and moveable framing be fixed to the narrow ledging of scarcely a foot high which commonly surrounds the opening to the hold, and carried up some 7 ft. or 8 ft. high, or even more, the last 2 ft. or 3 ft. taking a conical form; and at the extreme

* Stand-pipes, to be effective, would of course require a reform in the present water-supply.—Ed.

top an opening to be left, to serve as a chimney for the escape of the combustible air or gas. The reason for elevating this hold-covering so considerably is to preserve the cargo from heavy seas washing into the hold and destroying very frequently the greater portion of its contents. The orifice or chimney might, perhaps, be judiciously fitted with a tube, whose lowest end, or that terminating in the hold, might have a "rose" top, similar to those attached to the watering-pots used in gardening operations. Should a fire break out in the hold, a hose could be fixed to the upper end of the chimney, and a stream of water thrown down, which, by means of the "rose" top, would be spread over a larger extent of surface.

In prisons, in poor-houses or unions, and in every large public or private establishment serviceable fire-engines should be kept, and amateur companies or brigades organized to work them. Such a course of training would be physically and mentally valuable in all cases, and especially relieve the dreariness of a pauper's existence.

For safety as a means of escape from fire, and indeed in all other respects, I maintain a preference for flat roofs, or, at least, but slightly inclined or sloped at each end of a roof. This would suffice to carry off the rainfall; and each house might be kept inviolate from its neighbour by means of a high and close railing. At some part of this there should be a gate, and kept constantly locked, the key to which should be conveniently accessible. An iron ladder should be hung up or fixed against the wall at the top of a house, so as to be readily detached and available for passage through the trap-door in roof.

It has been suggested that balconies should be constructed at the first-floor windows from the street level, and at every succeeding floor upwards. This has been objected to on the ground that such a means of escape from fire might be improperly used, and also facilitate robberies. It would be easy to obviate such a possible consequence.

It occurred to the writer so long back as 1861, that a telescopic sliding principle might be usefully applied to fire-escapes. Three (or more) lengths of ladder, containing one within another, might be wound up by a winch readily; or they might be folded up into several pieces or lengths, and in either case be much less unwieldy; and, what is still more important, they could, of course, be shortened or lengthened, so as to reach the various floors and elevations of a building.

Our greatly boasted ingenuity and invention seem hitherto to have proved but pretence. The "Fire Annihilator" is rarely if ever employed. The Duke of Sutherland, the Earl of Caithness, and other noblemen and gentlemen, have formed themselves into an association for encouraging anti-ignitive inventions. Great ingenuity has been shown in the production of combustibles; but it would be more conducive to human happiness if at least an equal amount of mental labour were devoted to the origination and manufacture of such matters as would extinguish fires. A "Fire Prevention Act" should be passed, compelling the attention of all connected with the construction and proprietorship of houses and buildings.

The fire-guards hitherto in use, although they might vary in shape, have all been constructed upon the same principle, involving the adjustment and removal of the guard in order to replenish a fire with fuel or otherwise attend to its continuance and details. This objectionable feature might be removed, and a perfectly preventive guard or mechanism devised that would be a fixture, and not require, consequently, the trouble of being continually fixed and unfixed.

In the building up of new houses, the balancing-weight, &c., could be enclosed in a tubing on each side of, and within the brickwork, of a fire-place; the sash running up a little way into the chimney. The sash should be made of iron or other metal, the guard or blind-like part being a sheet of iron, zinc, &c., perforated with numerous holes, so as to present a gauze or sieve-like texture; and thus allow the fire-heat to pass through to the room, yet protecting clothing from the possibility of contact with the fire, and also preventing burning coal from flying out and firing a room.

I may here suggest a very cheap and simple life preservative apparatus which could and should be in the possession of every separate family, inhabitant, or temporary indweller of each house or apartment. This consists in providing a stout and moderately thick rope; yet not so thick but that it might be easily tied or affixed. It should be sufficiently long to reach from a bed-post or other heavy article, through a room window, and thence to the ground; and it must be strong enough to bear the weight of any person, however heavy, who may be resident in such apartment. The rope should be kept in one place only, and loosely coiled round a large hook or nail, not too high up for ready access by means of a chair, yet not too low for any children or others, or cats, dogs, &c. to tamper and play tricks with. When needed for use, one end is to be fixed to the post of a bed or any other heavy article of furniture, or even it might be longer and fastened to the room door, by running it through the key-hole and tying it to the edge of the door: the latter being locked would offer a strong resistance to the weight of a descending human body. If the bedstead or other article had posts or projections, a loop or a slip knot might be made, and so being fixed thereto it would obviate any delay from tying it up when a fire happened. A simple contrivance like this would save many lives, if not every life endangered.

For the better protection of firemen, there should be an improvement upon the present helmet or head-covering. At present, the men incur the dangerous possibility of being scorched and injured in the face, and are hindered thereby from rendering greater service than is now possible from their exposure to flame and fire. It is proposed, therefore, that the helmet be made somewhat after the style of the ancient ones worn by soldiers in the days when armour was in use. This is to be provided with glass, or, better still, mica, in the openings for the eyes to see through, and corresponding apertures for the nose and mouth.

Fire brigades attached to each "volunteer" regiment might prove valuable auxiliaries. The system of organization adopted by the firemen companies in New York and in Australia, might probably be reproduced here with advantage, though these would perhaps require modification, to suit with English habits and characteristics.

It has been suggested in the *Builder* to use alum for the suppression of fires. This chemical is a powerful non-conductor of heat, cheap, and readily obtained. At a moderate heat it dissolves, and liberates its water of crystallization in the shape of vapour. Although only recommended to be employed in large buildings, filling in iron hollow cellular beams, joists, &c. It might be beneficially used in all houses and buildings, however small, and where no iron-work is at present made subservient. Between the floor and ceiling of each succeeding room, and between each room and house wall,—space being left for the purpose,—alum might be filled in, either in a powdered state or in blocks of a suitable size. W. M. M.

OXFORD NEW WORKHOUSE.

THE designs for the new workhouse for Oxford were obtained, it will be remembered, in a competition open only to architects residing in Oxford. The accommodation required was for 330 inmates. The building is now completed, with certain exceptions to be mentioned, and is set forth by the accompanying engravings. The foundation-stone was laid on the 6th of April, 1863. The site consists of about 12 acres of clay soil, on the north side of the Cowley-road, and was purchased for about 2,800*l*. The building is of red and white brick, with dressings of Bath stone. Its base being about 20 ft. above the level of the road, it forms a conspicuous object from many directions. It consists of three principal ranges or blocks, parallel to each other, approached by a wide road which leads to the centre of the house. The centre portion of the front range of buildings comprises two stories, with entrance archway, surmounted by a bell-cote. This portion is allotted to the porter's day and bed rooms, clerk's and committee rooms; and the other portions of the range, forming wings on either side, contain a board-room and dispensary. Beyond these are the receiving wards and tramp wards for both sexes, with separate entrances to each from without, and also private entrances from within, for the use of the officials. Passing through the great archway, in a straight line, at a distance of 120 ft., is the main building, 258 ft. by 44 ft., forming the northern side of the quadrangle. It has a central corridor extending the whole length of the building, with a large and lofty hall in the centre, over which is a tower, 90 ft. in height to the vane, serving the purposes of a staircase for the use of the master and matron and of a ventilating shaft. The building is divided into separate day-rooms and dormitories for the several classes of inmates, each class being kept quite distinct, having its own staircase, lavatories, and yards. The aged of both sexes occupy the front, and the able-bodied the back, where yards are already formed, and workshops, laundries, &c., erected.

The kitchen, offices, and dining-hall are at the back of the main building, being approached by well-arranged separate covered ways.

The infirmary, which is not yet commenced, will be at the back of the whole on the higher ground, with the nurses' rooms for each class, the fever wards being on the third story, with separate staircases from the back. The chapel, which is also not begun, will be of a cruciform shape, inclosed by iron railings, and detached from the workhouse.

The staircases in the building are of York stone, and all the internal walls are of brick-work. The dormitories are 12 ft. in height. Bath stone has been used for cornices, brackets, and tabling. The apartments are warmed with hot-water pipes, fireplaces however being provided, and the cooking is also performed by steam. An attempt was made to procure water on the spot, but without much success, and an arrangement was consequently made with the trustees of the City Water Works to lay a main to the cistern. The guardians obtained authority from the Poor Law Board to effect a loan of 9,000*l*., repayable by instalments, to meet the cost of the site and building, and the contract was taken by Mr. Curtis for 6,000*l*., besides extra items, making a total of 7,155*l*. Up to the present time the expenditure has been 8,939*l*., independently of several payments which will fall due, and of the chapel and infirmary, which have yet to be erected. An extra levy of 6d. in the pound has been necessary this quarter, mainly on account of the roads, fittings, &c., which cannot legally be charged on the loan; but the old site of 5½ acres having been disposed of for upwards of 8,000*l*., the permanent burden on the city caused by the new house will not be large. The architect was Mr. W. Fisher, of Oxford; and the clerk of works was Mr. John Castle.

REFERENCES TO PLAN.

FRONT RANGE.
1. Board-room.
2. Waiting-rooms.
3. Porter's-room.
4. Dispensary.
5. Strong Closet.
6. Clothes-store.
7. Drying-room for Clothing.
8. Tramps Ward.
9. Sick Tramps Ward.
10. Probationary Day-rooms.
11. Ditto Bed-rooms.
12. Cutaneous Diseases Wards.

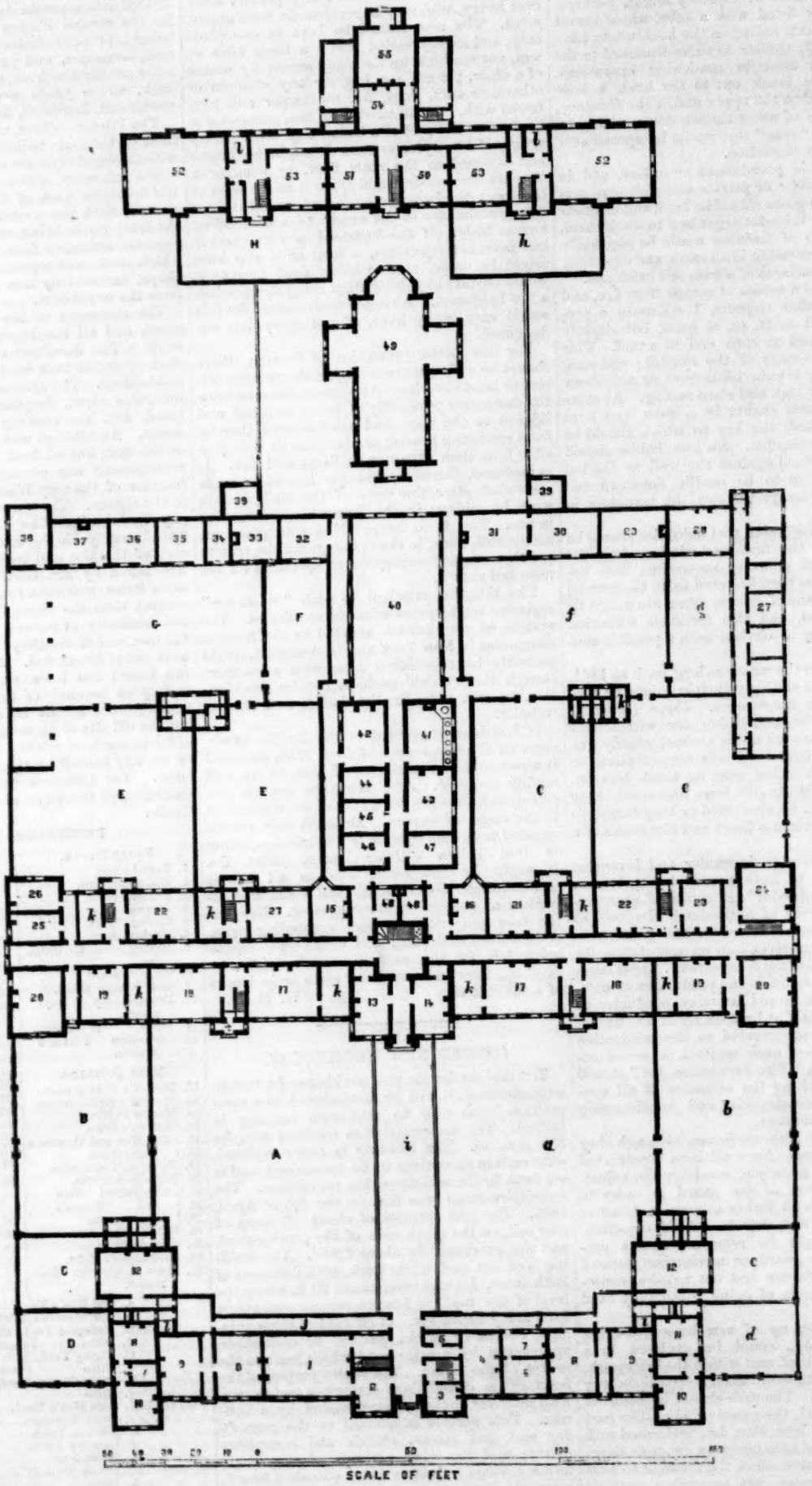
MAIN BUILDING.
13. Master's Sitting-room.
14. Matron's Sitting-room.
15. Master's Office.
16. Matron's ditto.
17. } Old Men and Women's
18. } Day-rooms.
19. Epileptic Day-rooms.
20. Ditto Bed-rooms.
21. } Able-bodied Men
22. } and Women's
23. } Day-rooms.
24. Day Nursery.
25. Tailor's Shop.
26. Shoemaker's ditto.
27. Married Couples' Bed-rooms.
28. Married Couples' Day-room.

OFFICES.
29. Wash-house.
30. Laundry.
31. Drying-room.
32. Coal-house.
33. Brew-house.
34. Oakum.
35. Gypsum-pounding.
36. Ditto Store-house.
37. Ditto Boiling-room.
38. Carpenter's Shop.
39. Refractory Cells.
40. Dining-hall.
41. Steam Cooking.
42. Scullery.
43. Kitchen.
44. Buttery.
45. Bread-room.
46. Meat-store.
47. Ditto.
48. Dry Stores.
49. Chapel.

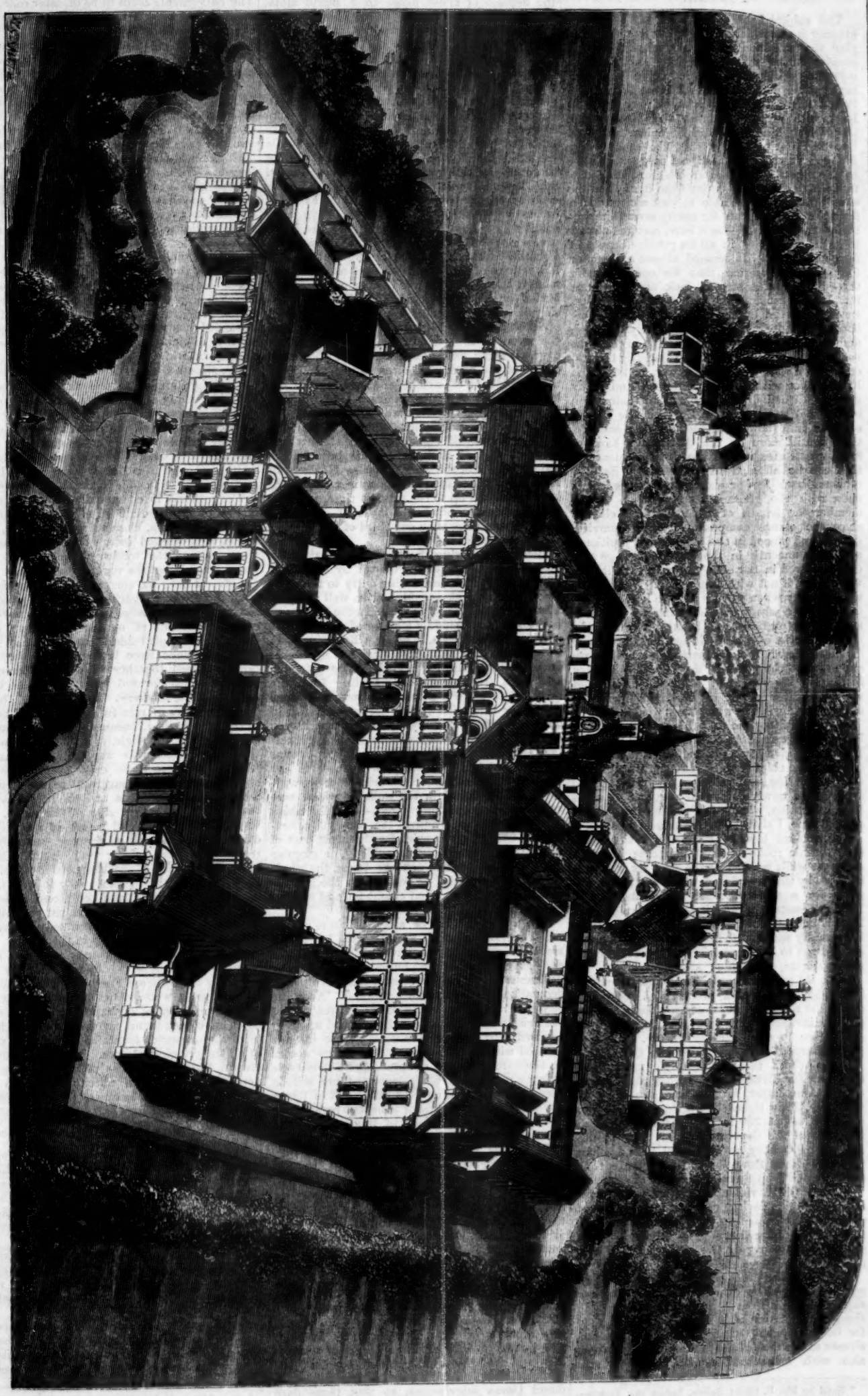
INFIRMARY.
50. Surgery.
51. Nurses' Room.
52. Sick Ward.
53. Convalescent Ward.
54. } Venereal Wards.
55. }

A. Old Men's Yard.
a. Old Women's Yard.
B. Epileptic Yard, Male.
b. Ditto Female.
C. Airing Yard, Male.
c. Ditto Female.
D. Probationary Yard, Male.
d. Ditto Female.
E E. Able Men's Yard.
e e. Ditto Women's.
F. Kitchen Yard.
f. Laundry Yard.
G. Work Yard.
H. Airing Yard, Male.
h. Ditto Female.
i. Entrance Roadway.
j. Covered Way to Tramps' Ward, &c.
k. Baths and Lavatories.
l. Baths.

MANCHESTER ALBERT MEMORIAL.—The *Manchester City News* is asking what has become of the Prince Consort's statue with which that city was to be endowed, or what hinders its erection?



OXFORD NEW WORKHOUSE.—*Ground Plan.*



OXFORD NEW WORKHOUSE.—MR. W. FISHER, ARCHITECT.

POMPEII.*

The subject I have chosen for my paper this evening is one which, I think, has not yet occupied the attention of the Association,—at all events, during my recollection; and I esteem myself especially fortunate in having the opportunity of so doing, because I remember that I looked forward to no portion of my route in Italy with greater interest than that which should include Pompeii and Herculaneum. And I am inclined to believe that the same feeling influences us all; and *that*, not only with a view to any practical hints in architecture or decoration which one might derive from it, as from the simple *fact* of being able to visit a city hidden from the sight of man for nearly seventeen centuries, and exhumed,—as it were, restored almost to its original state, in all its pristine beauty of form and colour. It seemed almost a dream or fairy-tale to imagine that we could wander through the same streets, look upon the same temples and monuments, enter the same doorways, and tread on the pavement of the same houses, as those who had lived 1,800 years ago; and that all their features should be in the same condition as they were then. Generally the discovery of a wall, a gateway, tower, or temple, is looked upon with thrilling interest, and many are the learned dissertations as to their origin or original use. Here, in England, the finding of some ruin (now devastated by time and age, though still more by the destructive hand of man) constitutes one of the greatest pleasures that can be afforded us; and should its date remount back five or six centuries, it is looked upon with the greatest respect, when we remember the length of time that has elapsed since the stones composing it were quarried, carved, and placed in their respective positions; and be it uncouth in the extreme, its age renders it sacred in our eyes, and we regard it with veneration, if not with admiration. What, then, shall we say when we are able to look at buildings—nay, a whole city—bearing no traces of modern restoration and beautifying, not the uncouth works of a barbaric age, but of a people far more elevated in the artistic scale than we are even at the present day,—with a greater instinctive knowledge of form and colour, and with a greater power of displaying it in the different materials in which they worked?

Being the first time that this subject has been brought before the Association, I shall do right, I think, to give you a general description of the city and the chief characteristics of its architecture, decoration, and paintings, reserving special accounts of newly-excavated portions for some future occasion, when, after visiting the ruins a second time, I shall be better able to do so.

The ancient town of Pompeii was situate on the volcanic rocks of the Campania; its south and west walls washed by the sea; its east wall bounded by the river Sarno, which was then navigable for a short distance above its mouth. Though Seneca mentions it as a celebrated city, little is known about its early history. Its origin is generally ascribed to the Oscans, and its name is supposed to have been derived from the Greek word *πομπεια*, signifying "storehouses."

From its great richness, the country seems to have had the peculiar property of enervating those who settled there, rendering them an easy prey to invaders, who, enervated in their turn, gave place to some sterner enemy. Hence it was possessed successively by the Oscans, the Ausones (both these of Pelasgic extraction), Cumeans (or Etruscans), Samnites, and Campanians: these latter, in a second attack by the Samnites, threw themselves under the protection of Rome, about 360 B.C., and then sank down into one of the dependencies of that empire. About 91 B.C. they revolted, and then a colony was sent down from Rome to cultivate their territory and keep them in complete obedience.

In A.D. 63 a violent earthquake shook the city to its foundation, causing it to be almost abandoned for some months, at the end of which time the inhabitants gradually reappeared, and set to work to repair the damages done and rebuild the shattered edifices.

In A.D. 79 the great eruption occurred which covered Pompeii with showers of ashes and scoriæ, hiding it from sight, and thus preserving the greater portion of it more or less complete for our study and admiration. Herculaneum, situate at the foot of the mountain, was covered also with ashes and scoriæ; but the vast volumes of steam sent up by the volcano caused the deposit of these ashes in a liquid state, which solidifying, became as hard and compact as lava; so that the excavations of this latter town are more difficult to make, especially as subsequent eruptions have gradually poured their lava over the town, which is now found at a depth of 75 ft. below the present surface of the ground. These subsequent eruptions have been almost the cause of Pompeii's remaining more or less intact; for the inhabitants returned again after the burial of their city to search for its treasures; and would probably have settled there up to this present day (as at Portici and Resina, built over Herculaneum, after each successive eruption). As many as eight successive layers, some of lava, have been counted over Pompeii, and it is only the lower one, which first buried the town, that has been disturbed. This accounts for the fact that so few articles of intrinsic value, such as jewels and money, have been preserved. Pompeii remained buried for nearly seventeen centuries, and it is singular that Domenico Fontana, a celebrated architect, who in 1592 was employed to bring the water of the Sarno across the city to the town of Torre dell' Annunziata, and who in the course of the work must often have encountered the foundations of ancient buildings, should not have had his curiosity awakened as to their origin; in fact, the city was entirely lost till 1748, when a countryman sinking a well discovered a painted chamber, with statues and other objects of antiquity. This brought the attention to it of the king, Charles III., and in 1755 the works of excavation commenced, which have continued up to the present time, more or less slowly; so that after a lapse of 120 years, probably not more than one-third of the city has been excavated.

Before the laying down of the railway, the visitor generally entered Pompeii by the street of tombs; and a more fitting entry to the desolate and empty city could not be well afforded. The street rises as it approaches the walls, and is lined on each side by a series of tombs, some of great magnificence, it being a Roman custom to bury the dead not in cemeteries or spaces set apart for that purpose, but along the principal and most frequented roads leading from the town: thus the Via Appia, at Rome, is fringed on either side with tombs, for upwards of 13 miles away from the city. The Romans, as you are aware, burned their dead, and then, collecting the ashes, placed them in small jars, or urns (the origin of those delightful features in our modern churches and cemeteries): these were deposited in vaults, in the walls of which were small niches resembling pigeon-holes, for which these vaults have acquired the name of columbaria. The tombs consist for the most part of a small altar, either square, oblong, or circular in plan, raised on two or three steps, the whole carried by a pedestal or podium (in the interior of which was the vaulted chamber), and a small inclosure with low wall around.

The upper portion, or altar, of these tombs, was generally in white marble, with bas-reliefs and inscriptions on them recording the virtues and exploits of those buried beneath. The podium was in masonry, ornamented with stucco decorations, and sometimes painted. Near the city gate are some tombs of larger size, one of the Priestess Mammia, built in stuccoed masonry adorned with columns, the walls of the interior covered with arabesque work: two large exedra or semicircular seats in stone, and a hemicycle or large niche very richly decorated, are still in very good preservation. In this street of tombs are also one or two villas or suburban residences; of one of which, "the Villa of Diomede," I shall have a word to say farther on.

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Outside the gate was a niched tomb, long taken for a sentry-box, from the fact that the skeleton of a soldier, in the usual accoutrement and arms, grasping a lance, was found in it, instanced as a proof of the excellent and praiseworthy discipline of the Roman soldier, who remained faithful to his duty to the last.

The streets are for the most part straight, and run at right angles to one another. They are not wide, many of them not admitting of the passage of more than one chariot at a time; and probably these were not much used, taking into account the small extent of the city (only three-quarters of a mile in length, and half-a-mile in width), though the deeply-worn ruts in the stones would seem to indicate the contrary.

The roadway is composed of huge polygonal masses of lava, from 9 in. to 18 in. in diameter, and 9 in. in depth, closely fitted together. The stones were worked in a wedge shape, so that they spanned the roadway like a vault, each stone resembling the voussoir of an arch. All the streets have pavements for foot-passengers, even those where chariots could not pass, consisting of curb-stones of lava, with the pavement composed of bits of marble and stone, set in cement, the whole rubbed flat. In places where the curb-stones have broken away, they have been cramped together with iron. These foot-pavements are elevated sometimes more than a foot above the roadway. It is supposed that the latter, in times of rain (which falls very heavily in those countries), became a kind of sewer, as all the streets are slightly inclined one way or the other; and this supposition seems well founded, because there exist everywhere huge stepping-stones from pavement to pavement, the wheels of the carriages and the horses (always two) passing on either side of the stone. The way in which the solid refuse of the city was carried away is still a mystery, scarcely any traces of sewers having been found. Mazois gives us a drawing of one, the position of which he does not state; but it seems only to have served to carry the waters from the street under the walls to outside the town. It is just possible that the streets may have been the only sewers, as they are still in some towns in the East.

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The public edifices and monuments of Pompeii give more direct information as to its history than aught else. The more ancient are essentially Greek, both in plan of building and style; the later edifices show the influence of Roman customs and habits, though always preserving a certain Greek feeling.

In a description of a Roman city, the Forum is the first place to which we should direct our attention, as the centre of business, the resort for pleasure, and the scene of all political and legal contention.

The Forum is the largest and most imposing spot in Pompeii, measuring 500 ft. in length, and 150 ft. in width. It was surrounded on three sides by a portico of Doric columns, set

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wider apart than usual, so that stones could not be depended upon to span the distance between them; and accordingly wooden beams were used, on which rested the stone entablature, in the back of which holes were cut to receive the ends of joists of a gallery, which extended over the portico round the Forum. Several pedestals of masonry, deprived of their statues and marble coatings, still exist, and some bear still the names of the distinguished inhabitants in whose honour they were erected. At the north end of the Forum is situate the Temple of Jupiter, on an elevated podium or basement, reached by steps flanked on either side by pedestals for statues. The temple has a portico of six columns in front, and three on the side. The columns are about 3 ft. 8 in diameter, which would give 36 ft. 8 in. for their height. In the interior of the cella on either side was a row of columns of smaller size, on which probably rested a second row, as at Pæstum, to support the roof, and a gallery, the stairs to reach which are at the further end of the temple, as also three small chambers for the priests. The painting of the interior is not remarkable: the floor is paved with mosaic.

The prisons on the right are approached by an archway in brick, formerly covered with slabs of marble. These prisons consist of dungeons without light, in which skeletons were found, with their leg-bones encircled in iron shackles or stocks.

The Temple of Venus stood in a large area, 180 ft. by 75 ft., surrounded by a wall and portico. The columns of this portico were originally Doric, but afterwards altered into Corinthian by successive coats of stucco, an anomaly which I will explain further on. The walls of this portico were decorated with a series of paintings on a black ground, representing architectural scenes, landscapes, and figure subjects. The temple itself stood upon an elevated basement; had a portico of four columns in front, and two deep; and a peristyle round the cella, which latter was very small. There was an inscription in it, stating that "Marcus, Holconius Rufus and Caius, Ignatius Posthumus, decemvirs of justice for the third time, by a decree of the Decurions, bought again the right of closing the openings for 3,000 sesterces, and took care to erect a private wall up to the roof of the incorporated Venereans;"—the proceedings of that corporation, I suppose, being of such a nature that it was wise to conceal them from the public gaze.

The Basilica, or court of justice, is the largest building in Pompeii, of an oblong form, and measures 220 ft. by 80 ft. It is entered through a vestibule, by five doorways of masonry, in which grooves have been cut for the insertion of wooden door-jambs. From the vestibule the area of the Basilica is reached by a flight of four steps, leading through principal and two side doorways. The roof was carried by a peristyle of twenty large Ionic columns, built in brick and tufa, covered with stucco. The centre was probably open to the sky. At the further end of the building, on each side, are two square chalcidica; in the centre, the tribune for the judges raised on a basement, and approached on either side by steps. It was decorated by columns, detached and semi-detached; between the latter were spaces for cupboards, in which the robes or records were kept. There was a gallery round the peristyle, reaching up about half the height of the Ionic columns, with a railing between them, to prevent persons falling over.

The three buildings at the south end of the Forum, opposite the Temple of Jupiter, are similar in plan; two of them are supposed to have been places of assembly for magistrates; the third is an ærarium, or treasury.

The Chalcidicum, or Cryptoportico, of Eumachia is the next largest building to the Basilica: it is supposed to have been the Exchange of the cloth merchants. The interior was surrounded by a double gallery of forty-eight very beautiful columns of white marble (only one of which, broken, has been found); a chalcidicum, or enclosed apartment, at the further extremity; and a cryptoportico (a gallery in which the spaces between the columns are walled up and pierced with windows). Behind the chalcidicum was a niche, in which stood a statue of Eumachia, at whose expense the building was erected. The Temple of Mercury now serves as a museum for all those objects found in the excavations, and not taken to the museum at Naples. The House of the Augustals, or Pantheon, as it is called, from the twelve pedestals in the centre of its court, in which it was supposed were the Dii Consentes, though from the numerous culinary paintings on the north wall, and the large collection of fish-bones and other fragments of food found in the sink in the centre, it would seem more to have been devoted to banqueting than religious purposes; and, indeed, its contiguous position to the Forum would point it out as a very convenient place for a large tratteria or restaurant; the twelve rooms on the south side being private dining-saloons. It is a spacious building, with entrances on three of its sides, the one from the Forum decorated with columns and niches with pedestals for statues. This completes the list of the monuments round the Forum, and we may look upon them as the most important of those in Pompeii.

The triangular Forum adjoining the large theatre, in the smaller part of the town, has a portico of ninety Doric columns round two of its sides. It is entered by a propylæa or vestibule, of eight Ionic columns, which, when complete, must have been one of the most beautiful features in Pompeii. The Temple of Hercules in this Forum is the most ancient building yet discovered here, its capitals, columns, and general construction resembling more the temples of Pæstum than any of the other temples in Pompeii: from its ruined state it is difficult to define exactly its plan; it was 120 ft. by 70 ft. wide.

The great or tragic theatre is placed on the south side of a hill of tufa, in which the steps or seats are cut. It was semicircular, open to the air, and lined in every part with white marble. The seats faced the south, commanding (as in all these ancient theatres) an extensive view, so that the visitor, if tired with the performances, could at all events solace himself with the enjoyment of the fine prospect before him. The walls of this theatre were never entirely buried, and the stage was covered with so slight a deposit only, that here (as, in fact, probably in the greater part of the most southern portion of Pompeii), the decorative parts, such as marble, statues, &c., may have been easily removed after the eruption. The general audience entered the theatre by an arched corridor, on a level with the colonnade of the triangular Forum, and descended thence into the cavea by six flights of stairs, which divided the seats into five wedge-shaped portions or cunei. The space allotted to each was 1 ft. 3½ in., so that from calculation the theatre would accommodate 5,000 persons. A separate entrance and staircase led to the women's gallery, which was placed above the corridor just mentioned, and divided into compartments or boxes. It seems also that they were protected from the gaze of the audience beneath by a screen of iron wire. In the lowest portions of the theatre, with special entrances, and separated by a low parapet or balustrade, was the præcinctio,—what we should call the pit or orchestra stalls, reserved for the nobles, Augustales, and patricians. The level space in front of the reserved seats was destined for the magistrates, whose seats, the bisellia in bronze, with purple cushions, were brought by their slaves. There was also some distinction made between the middle and lower classes, the latter occupying the higher range of seats, and being divided into their respective trades and occupations. The stage or pulpitum is a long narrow platform, with seven niches in the front of the wall which carries it, in which it is supposed the musicians were placed. The proscenium was decorated with columns, and niches between them for statues, with three doorways, the centre one larger than the others, and only entered by the important characters. Their scenery was very simple, either a door swinging on a centre axis or a triangle, the one having two, the other three different views represented on it, its position being in the central doorway. Behind the stage was the postscenium, where the actors' rooms were placed. The exterior of the upper wall round the theatre still retains the projecting stone rings for receiving the poles of the velarium or awning, which on special occasions was spread over the theatre.

The small theatre adjoining is supposed to have been used for musical performances. It is also semicircular, and similar in arrangement to the other, except that a portion of the circle is cut off on either side by walls continued from the side of the stage. The style and execution of the work are very inferior to the other, which is explained by the fact of an inscription, stating that it was built by contract. It seems to have been permanently roofed in, and accommodated 1,500 persons.

Adjoining the theatre is a large forum, surrounded by a portico of columns, supposed to have been occupied by the soldiers, from the large amount of armour discovered. In the various rooms round these were two floors, the officers occupying the first floor. Inside one of the entrance-gates, also, were found the skeletons of thirty-four soldiers,—the guard, probably, called out on the night of the eruption. Sixty-three skeletons in all were found in the barracks,—more than in all the rest of Pompeii.

In the south-east angle of the city walls is the amphitheatre, intended for gladiatorial shows, the chase, and combat of wild beasts. It was here that the people were supposed to have been assembled when the grand eruption took place. From the number it would accommodate (10,000) and the interest taken in these shows, it was probable that more than half the inhabitants were there. From the sharpness of all its mouldings and little wear visible on the stone-work, it is probable that this building was erected not long before the destruction of the city; and, from the absence of the greater part of its stone seats, that access was had to it after the eruption. Its form is elliptical, 430 ft. long by 135 ft. wide. The masonry of the walls is of the *opus incertum* kind, and also of bricks placed diagonally after the Roman fashion. The interior contained twenty-four rows of seats. There were separate entrances in different parts of the theatre, the patricians, nobles, and magistrates, as usual, occupying the lower ranges, the plebeians the upper, and the women the boxes. At each end of the ellipse were entrances into the arena, for the admission of the gladiators and wild beasts, and removal of the dead.

Various inscriptions announcing displays in the amphitheatre are found on the walls in the city: one more especially of them says that "On the occasion of the dedication of the public baths there will be a chase of wild beasts, athletic contests, sprinkling of perfumes, and an awning." The value of an awning will be easily appreciated by those who know either what the heat of an Italian sun is, or the deluge of an Italian rain. It has been a matter of some controversy how a temporary covering could be stretched over so large a space without any intermediate props. The stone rings existing on the upper portions of the exterior wall round the theatre gives me reason to suppose that *they* were intended to support and hold the wooden masts to which the ropes carrying the awning were attached: there must have been considerable difficulty in keeping the awning stretched sufficiently tight, and we find that on windy days it was impossible sometimes to stretch them. As to the sprinkling of perfumes, Seneca tells us that "the perfumes were disseminated by being mixed with boiling water, so that the scent rose with the steam and became diffused throughout the building." Rimmel's patent vaporizer, therefore, introduced three years ago, at the pantomimes in all the chief theatres of London, was by no means a novel idea.

The Temple of Isis is a small but interesting building, standing on a basement in the centre of a court, round which is a portico of Corinthian columns, in brick, covered with stucco, and painted. In one corner of the court is an ædiculum with a vaulted roof, and pediment covering the sacred well of lustral purification, to descend to which there was a narrow flight of steps. Near it was an altar, on which were found the burnt bones of victims. On the south side of the inclosure were the chambers of the priests and a kitchen. In one room a skeleton was found holding a sacrificial axe, with which he had cut his way through two walls to escape from the eruption, but perished before he could penetrate the third. In another room a skeleton was found with bones of chickens and fish, egg-shells, bread, wine, and a garland of flowers, as if he had been beguiling away the last moments of his life merrily. Many other skeletons were found in the inclosure, testifying to the belief in the power of their deity.

A flight of steps leads to the temple, the front of which is a portico of six Corinthian columns, with niches on either side of the entrance to the cella, the interior of which is small; the entire width of the back, occupied by a long hollow pedestal for statues, having two low doorways at the end near the secret stairs, by which the priest could enter unperceived and deliver the oracles as if they proceeded from the mouth of the goddess herself.

Public Baths.

Two large establishments have been found in Pompeii. They are based on a similar system to the so-called Turkish baths lately introduced

POMPEII.*

The subject I have chosen for my paper this evening is one which, I think, has not yet occupied the attention of the Association,—at all events, during my recollection; and I esteem myself especially fortunate in having the opportunity of so doing, because I remember that I looked forward to no portion of my route in Italy with greater interest than that which should include Pompeii and Herculaneum. And I am inclined to believe that the same feeling influences us all; and *that*, not only with a view to any practical hints in architecture or decoration which one might derive from it, as from the simple *fact* of being able to visit a city hidden from the sight of man for nearly seventeen centuries, and exhumed,—as it were, restored almost to its original state, in all its pristine beauty of form and colour. It seemed almost a dream or fairy-tale to imagine that we could wander through the same streets, look upon the same temples and monuments, enter the same doorways, and tread on the pavement of the same houses, as those who had lived 1,800 years ago; and that all their features should be in the same condition as they were then. Generally the discovery of a wall, a gateway, tower, or temple, is looked upon with thrilling interest, and many are the learned dissertations as to their origin or original use. Here, in England, the finding of some ruin (now devastated by time and age, though still more by the destructive hand of man) constitutes one of the greatest pleasures that can be afforded us; and should its date remount back five or six centuries, it is looked upon with the greatest respect, when we remember the length of time that has elapsed since the stones composing it were quarried, carved, and placed in their respective positions; and be it uncouth in the extreme, its age renders it sacred in our eyes, and we regard it with veneration, if not with admiration. What, then, shall we say when we are able to look at buildings—nay, a whole city—bearing no traces of modern restoration and beautifying, not the uncouth works of a barbaric age, but of a people far more elevated in the artistic scale than we are even at the present day,—with a greater instinctive knowledge of form and colour, and with a greater power of displaying it in the different materials in which they worked?

Being the first time that this subject has been brought before the Association, I shall do right, I think, to give you a general description of the city and the chief characteristics of its architecture, decoration, and paintings, reserving special accounts of newly-excavated portions for some future occasion, when, after visiting the ruins a second time, I shall be better able to do so.

The ancient town of Pompeii was situate on the volcanic rocks of the Campania; its south and west walls washed by the sea; its east wall bounded by the river Sarno, which was then navigable for a short distance above its mouth. Though Seneca mentions it as a celebrated city, little is known about its early history. Its origin is generally ascribed to the Oscans, and its name is supposed to have been derived from the Greek word πομπεια, signifying "storehouses."

From its great richness, the country seems to have had the peculiar property of enervating those who settled there, rendering them an easy prey to invaders, who, enervated in their turn, gave place to some sterner enemy. Hence it was possessed successively by the Oscans, the Ausones (both these of Pelasgic extraction), Cumeans (or Etruscans), Samnites, and Campanians: these latter, in a second attack by the Samnites, threw themselves under the protection of Rome, about 360 B.C., and then sank down into one of the dependencies of that empire. About 91 B.C. they revolted, and then a colony was sent down from Rome to cultivate their territory and keep them in complete obedience.

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Adjoining the theatre is a large forum, surrounded by a portico of columns, supposed to have been occupied by the soldiers, from the large amount of armour discovered. In the various rooms round these were two floors, the officers occupying the first floor. Inside one of the entrance-gates, also, were found the skeletons of thirty-four soldiers,—the guard, probably, called out on the night of the eruption. Sixty-three skeletons in all were found in the barracks,—more than in all the rest of Pompeii.

In the south-east angle of the city walls is the amphitheatre, intended for gladiatorial shows, the chase, and combat of wild beasts. It was here that the people were supposed to have been assembled when the grand eruption took place. From the number it would accommodate (10,000) and the interest taken in these shows, it was probable that more than half the inhabitants were there. From the sharpness of all its mouldings and little wear visible on the stone-work, it is probable that this building was erected not long before the destruction of the city; and, from the absence of the greater part of its stone seats, that access was had to it after the eruption. Its form is elliptical, 430 ft. long by 135 ft. wide. The masonry of the walls is of the *opus incertum* kind, and also of bricks placed diagonally after the Roman fashion. The interior contained twenty-four rows of seats. There were separate entrances in different parts of the theatre, the patricians, nobles, and magistrates, as usual, occupying the lower ranges, the plebeians the upper, and the women the boxes. At each end of the ellipse were entrances into the arena, for the admission of the gladiators and wild beasts, and removal of the dead.

Various inscriptions announcing displays in the amphitheatre are found on the walls in the city: one more especially of them says that "On the occasion of the dedication of the public baths there will be a chase of wild beasts, athletic contests, sprinkling of perfumes, and an awning." The value of an awning will be easily appreciated by those who know either what the heat of an Italian sun is, or the deluge of an Italian rain. It has been a matter of some controversy how a temporary covering could be stretched over so large a space without any intermediate props. The stone rings existing on the upper portions of the exterior wall round the theatre gives me reason to suppose that *they* were intended to support and hold the wooden masts to which the ropes carrying the awning were attached: there must have been considerable difficulty in keeping the awning stretched sufficiently tight, and we find that on windy days it was impossible sometimes to stretch them. As to the sprinkling of perfumes, Seneca tells us that "the perfumes were disseminated by being mixed with boiling water, so that the scent rose with the steam and became diffused throughout the building." Rimmel's patent vaporizer, therefore, introduced three years ago, at the pantomimes in all the chief theatres of London, was by no means a novel idea.

The Temple of Isis is a small but interesting building, standing on a basement in the centre of a court, round which is a portico of Corinthian columns, in brick, covered with stucco, and painted. In one corner of the court is an ædiculum with a vaulted roof, and pediment covering the sacred well of lustral purification, to descend to which there was a narrow flight of steps. Near it was an altar, on which were found the burnt bones of victims. On the south side of the inclosure were the chambers of the priests and a kitchen. In one room a skeleton was found holding a sacrificial axe, with which he had cut his way through two walls to escape from the eruption, but perished before he could penetrate the third. In another room a skeleton was found with bones of chickens and fish, egg-shells, bread, wine, and a garland of flowers, as if he had been beguiling away the last moments of his life merrily. Many other skeletons were found in the inclosure, testifying to the belief in the power of their deity.

A flight of steps leads to the temple, the front of which is a portico of six Corinthian columns, with niches on either side of the entrance to the cella, the interior of which is small; the entire width of the back, occupied by a long hollow pedestal for statues, having two low doorways at the end near the secret stairs, by which the priest could enter unperceived and deliver the oracles as if they proceeded from the mouth of the goddess herself.

Public Baths.

Two large establishments have been found in Pompeii. They are based on a similar system to the so-called Turkish baths lately introduced

POMPEII.*

The subject I have chosen for my paper this evening is one which, I think, has not yet occupied the attention of the Association,—at all events, during my recollection; and I esteem myself especially fortunate in having the opportunity of so doing, because I remember that I looked forward to no portion of my route in Italy with greater interest than that which should include Pompeii and Herculaneum. And I am inclined to believe that the same feeling influences us all; and *that*, not only with a view to any practical hints in architecture or decoration which one might derive from it, as from the simple *fact* of being able to visit a city hidden from the sight of man for nearly seventeen centuries, and exhumed,—as it were, restored almost to its original state, in all its pristine beauty of form and colour. It seemed almost a dream or fairy-tale to imagine that we could wander through the same streets, look upon the same temples and monuments, enter the same doorways, and tread on the pavement of the same houses, as those who had lived 1,800 years ago; and that all their features should be in the same condition as they were then. Generally the discovery of a wall, a gateway, tower, or temple, is looked upon with thrilling interest, and many are the learned dissertations as to their origin or original use. Here, in England, the finding of some ruin (now devastated by time and age, though still more by the destructive hand of man) constitutes one of the greatest pleasures that can be afforded us; and should its date remount back five or six centuries, it is looked upon with the greatest respect, when we remember the length of time that has elapsed since the stones composing it were quarried, carved, and placed in their respective positions; and be it uncouth in the extreme, its age renders it sacred in our eyes, and we regard it with veneration, if not with admiration. What, then, shall we say when we are able to look at buildings—nay, a whole city—bearing no traces of modern restoration and beautifying, not the uncouth works of a barbaric age, but of a people far more elevated in the artistic scale than we are even at the present day,—with a greater instinctive knowledge of form and colour, and with a greater power of displaying it in the different materials in which they worked?

Being the first time that this subject has been brought before the Association, I shall do right, I think, to give you a general description of the city and the chief characteristics of its architecture, decoration, and paintings, reserving special accounts of newly-excavated portions for some future occasion, when, after visiting the ruins a second time, I shall be better able to do so.

The ancient town of Pompeii was situate on the volcanic rocks of the Campania; its south and west walls washed by the sea; its east wall bounded by the river Sarno, which was then navigable for a short distance above its mouth. Though Seneca mentions it as a celebrated city, little is known about its early history. Its origin is generally ascribed to the Oscans, and its name is supposed to have been derived from the Greek word $\pi o\mu\pi\epsilon\iota\alpha$, signifying "storehouses."

From its great richness, the country seems to have had the peculiar property of enervating those who settled there, rendering them an easy prey to invaders, who, enervated in their turn, gave place to some sterner enemy. Hence it was possessed successively by the Oscans, the Ausones (both these of Pelasgic extraction), Cumæans (or Etruscans), Samnites, and Campanians: these latter, in a second attack by the Samnites, threw themselves under the protection of Rome, about 360 B.C., and then sank down into one of the dependencies of that empire. About 91 B.C. they revolted, and then a colony was sent down from Rome to cultivate their territory and keep them in complete obedience.

In A.D. 63 a violent earthquake shook the city to its foundation, causing it to be almost abandoned for some months, at the end of which time the inhabitants gradually reappeared, and set to work to repair the damages done and rebuild the shattered edifices.

In A.D. 79 the great eruption occurred which covered Pompeii with showers of ashes and scoriæ, hiding it from sight, and thus preserving the greater portion of it more or less complete for our study and admiration. Herculaneum, situate at the foot of the mountain, was covered also with ashes and scoriæ; but the vast volumes of steam sent up by the volcano caused the deposit of these ashes in a liquid state, which solidifying, became as hard and compact as lava; so that the excavations of this latter town are more difficult to make, especially as subsequent eruptions have gradually poured their lava over the town, which is now found at a depth of 75 ft. below the present surface of the ground. These subsequent eruptions have been almost the cause of Pompeii's remaining more or less intact; for the inhabitants returned again after the burial of their city to search for its treasures; and would probably have settled there up to this present day (as at Portici and Resina, built over Herculaneum, after each successive eruption). As many as eight successive layers, some of lava, have been counted over Pompeii, and it is only the lower one, which first buried the town, that has been disturbed. This accounts for the fact that so few articles of intrinsic value, such as jewels and money, have been preserved. Pompeii remained buried for nearly seventeen centuries, and it is singular that Domenico Fontana, a celebrated architect, who in 1592 was employed to bring the water of the Sarno across the city to the town of Torre dell' Annunziata, and who in the course of the work must often have encountered the foundations of ancient buildings, should not have had his curiosity awakened as to their origin; in fact, the city was entirely lost till 1748, when a countryman sinking a well discovered a painted chamber, with statues and other objects of antiquity. This brought the attention to it of the king, Charles III., and in 1755 the works of excavation commenced, which have continued up to the present time, more or less slowly; so that after a lapse of 120 years, probably not more than one-third of the city has been excavated.

Before the laying down of the railway, the visitor generally entered Pompeii by the street of tombs; and a more fitting entry to the desolate and empty city could not be well afforded. The street rises as it approaches the walls, and is lined on each side by a series of tombs, some of great magnificence, it being a Roman custom to bury the dead not in cemeteries or spaces set apart for that purpose, but along the principal and most frequented roads leading from the town: thus the Via Appia, at Rome, is fringed on either side with tombs, for upwards of 13 miles away from the city. The Romans, as you are aware, burned their dead, and then, collecting the ashes, placed them in small jars, or urns (the origin of those delightful features in our modern churches and cemeteries): these were deposited in vaults, in the walls of which were small niches resembling pigeon-holes, for which these vaults have acquired the name of columbaria. The tombs consist for the most part of a small altar, either square, oblong, or circular in plan, raised on two or three steps, the whole carried by a pedestal or podium (in the interior of which was the vaulted chamber), and a small inclosure with low wall around.

The upper portion, or altar, of these tombs, was generally in white marble, with bas-reliefs and inscriptions on them recording the virtues and exploits of those buried beneath. The podium was in masonry, ornamented with stucco decorations, and sometimes painted. Near the city gate are some tombs of larger size, one of the Priestess Mammia, built in stuccoed masonry adorned with columns, the walls of the interior covered with arabesque work: two large exedræ or semicircular seats in stone, and a hemicycle or large niche very richly decorated, are still in very good preservation. In this street of tombs are also one or two villas or suburban residences; of one of which, "the Villa of Diomede," I shall have a word to say farther on.

The walls surrounding the town have been traced throughout their whole extent, so that the size of the city is known. They are not more than two miles in length; and the space enclosed, about 160 acres, is of the form of an egg, at the apex or smaller end of which is the amphitheatre. The walls were of great solidity and width. They had a double parapet and terrace, the latter about 14 ft. wide, sufficient to admit of two chariots passing abreast. It was carried by two walls, the outer one with a slight batter, 25 ft. in height, the inner wall about 40 ft., and occasional flights of steps on the city side to admit of easy access on to the terraces. The walls are built of large blocks of volcanic tufa and travertine in horizontal courses with inclined joints; and on some of the stones are found Oscan inscriptions, so that these date probably from the foundation of the city. Square towers are placed at intervals along the walls. The battlements seem to be of later date, being built in that kind of work called *Opus incertum*, the rubble work of the ancients.

There are eight entrance-gates to the city, five of which are mere ruins; of the three others, the gate of Herculaneum, through which we enter from the street of tombs, is the most perfect. It is in Roman architecture, built in alternate courses of brick and lava, and consists of a central archway, 14 ft. 6 in. wide, and two side ones for foot-passengers, 4 ft. 6 in. wide each, these latter vaulted throughout their whole length. The central passage, of which the arch is gone, seems to have had an open space in the centre, so that the enemy who had already forced the portcullis might be attacked from above whilst endeavouring to force the second door which swung on pivots. The height of the arch is calculated at 20 ft.

Outside the gate was a niched tomb, long taken for a sentry-box, from the fact that the skeleton of a soldier, in the usual accoutrement and arms, grasping a lance, was found in it, instanced as a proof of the excellent and praiseworthy discipline of the Roman soldier, who remained faithful to his duty to the last.

The streets are for the most part straight, and run at right angles to one another. They are not wide, many of them not admitting of the passage of more than one chariot at a time; and probably these were not much used, taking into account the small extent of the city (only three-quarters of a mile in length, and half-a-mile in width), though the deeply-worn ruts in the stones would seem to indicate the contrary.

The roadway is composed of huge polygonal masses of lava, from 9 in. to 18 in. in diameter, and 9 in. in depth, closely fitted together. The stones were worked in a wedge shape, so that they spanned the roadway like a vault, each stone resembling the voussoir of an arch. All the streets have pavements for foot-passengers, even those where chariots could not pass, consisting of curb-stones of lava, with the pavement composed of bits of marble and stone, set in cement, the whole rubbed flat. In places where the curb-stones have broken away, they have been cramped together with iron. These foot-pavements are elevated sometimes more than a foot above the roadway. It is supposed that the latter, in times of rain (which falls very heavily in these countries), became a kind of sewer, as all the streets are slightly inclined one way or the other; and this supposition seems well founded, because there exist everywhere huge stepping-stones from pavement to pavement, the wheels of the carriages and the horses (always two) passing on either side of the stone. The way in which the solid refuse of the city was carried away is still a mystery, scarcely any traces of sewers having been found. Mazois gives us a drawing of one, the position of which he does not state; but it seems only to have served to carry the waters from the street under the walls to outside the town. It is just possible that the streets may have been the only sewers, as they are still in some towns in the East.

Though traces of aqueducts are found in the country around, it is not known with any great certainty from whence Pompeii was so plentifully supplied with water, there being no wells.* A very large number of leaden and earthenware pipes have been found, the former of which supplied the numerous fountains which were placed in all the principal streets. They consisted of a cistern, formed of blocks of lava, cramped together with iron, the water falling into them through a pipe fixed in one of the back stones of the cistern, which rises higher than the rest.

Public Buildings.

The public edifices and monuments of Pompeii give more direct information as to its history than aught else. The more ancient are essentially Greek, both in plan of building and style; the later edifices show the influence of Roman customs and habits, though always preserving a certain Greek feeling.

In a description of a Roman city, the Forum is the first place to which we should direct our attention, as the centre of business, the resort for pleasure, and the scene of all political and legal contention.

The Forum is the largest and most imposing spot in Pompeii, measuring 500 ft. in length, and 150 ft. in width. It was surrounded on three sides by a portico of Doric columns, set

* Read by Mr. R. Phéné Spiers, before the Architectural Association, January 20th.

* One deep well has been recently discovered, with good potable water in it.—Ed.

wider apart than usual, so that stones could not be depended upon to span the distance between them; and accordingly wooden beams were used, on which rested the stone entablature, in the back of which holes were cut to receive the ends of joists of a gallery, which extended over the portico round the Forum. Several pedestals of masonry, deprived of their statues and marble coatings, still exist, and some bear still the names of the distinguished inhabitants in whose honour they were erected. At the north end of the Forum is situate the Temple of Jupiter, on an elevated podium or basement, reached by steps flanked on either side by pedestals for statues. The temple has a portico of six columns in front, and three on the side. The columns are about 3 ft. 8 in diameter, which would give 36 ft. 8 in. for their height. In the interior of the cella on either side was a row of columns of smaller size, on which probably rested a second row, as at Pæstum, to support the roof, and a gallery, the stairs to reach which are at the further end of the temple, as also three small chambers for the priests. The painting of the interior is not remarkable: the floor is paved with mosaic.

The prisons on the right are approached by an archway in brick, formerly covered with slabs of marble. These prisons consist of dungeons without light, in which skeletons were found, with their leg-bones encircled in iron shackles or stocks.

The Temple of Venus stood in a large area, 180 ft. by 75 ft., surrounded by a wall and portico. The columns of this portico were originally Doric, but afterwards altered into Corinthian by successive coats of stucco, an anomaly which I will explain further on. The walls of this portico were decorated with a series of paintings on a black ground, representing architectural scenes, landscapes, and figure subjects. The temple itself stood upon an elevated basement; had a portico of four columns in front, and two deep; and a peristyle round the cella, which latter was very small. There was an inscription in it, stating that "Marcus, Holconius Rufus and Caius, Ignatius Posthumus, decemvirs of justice for the third time, by a decree of the Decurions, bought again the right of closing the openings for 3,000 sesterces, and took care to erect a private wall up to the roof of the incorporated Venereans;"—the proceedings of that corporation, I suppose, being of such a nature that it was wise to conceal them from the public gaze.

The Basilica, or court of justice, is the largest building in Pompeii, of an oblong form, and measures 220 ft. by 80 ft. It is entered through a vestibule, by five doorways of masonry, in which grooves have been cut for the insertion of wooden door-jambs. From the vestibule the area of the Basilica is reached by a flight of four steps, leading through principal and two side doorways. The roof was carried by a peristyle of twenty large Ionic columns, built in brick and tufa, covered with stucco. The centre was probably open to the sky. At the further end of the building, on each side, are two square chalcidica; in the centre, the tribune for the judges raised on a basement, and approached on either side by steps. It was decorated by columns, detached and semi-detached; between the latter were spaces for cupboards, in which the robes or records were kept. There was a gallery round the peristyle, reaching up about half the height of the Ionic columns, with a railing between them, to prevent persons falling over.

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The small theatre adjoining is supposed to have been used for musical performances. It is also semicircular, and similar in arrangement to the other, except that a portion of the circle is cut off on either side by walls continued from the side of the stage. The style and execution of the work are very inferior to the other, which is explained by the fact of an inscription, stating that it was built by contract. It seems to have been permanently roofed in, and accommodated 1,500 persons.

Adjoining the theatre is a large forum, surrounded by a portico of columns, supposed to have been occupied by the soldiers, from the large amount of armour discovered. In the various rooms round these were two floors, the officers occupying the first floor. Inside one of the entrance-gates, also, were found the skeletons of thirty-four soldiers,—the guard, probably, called out on the night of the eruption. Sixty-three skeletons in all were found in the barracks,—more than in all the rest of Pompeii.

In the south-east angle of the city walls is the amphitheatre, intended for gladiatorial shows, the chase, and combat of wild beasts. It was here that the people were supposed to have been assembled when the grand eruption took place. From the number it would accommodate (10,000) and the interest taken in these shows, it was probable that more than half the inhabitants were there. From the sharpness of all its mouldings and little wear visible on the stone-work, it is probable that this building was erected not long before the destruction of the city; and, from the absence of the greater part of its stone seats, that access was had to it after the eruption. Its form is elliptical, 430 ft. long by 135 ft. wide. The masonry of the walls is of the *opus incertum* kind, and also of bricks placed diagonally after the Roman fashion. The interior contained twenty-four rows of seats. There were separate entrances in different parts of the theatre, the patricians, nobles, and magistrates, as usual, occupying the lower ranges, the plebeians the upper, and the women the boxes. At each end of the ellipse were entrances into the arena, for the admission of the gladiators and wild beasts, and removal of the dead.

Various inscriptions announcing displays in the amphitheatre are found on the walls in the city: one more especially of them says that "On the occasion of the dedication of the public baths there will be a chase of wild beasts, athletic contests, sprinkling of perfumes, and an awning." The value of an awning will be easily appreciated by those who know either what the heat of an Italian sun is, or the deluge of an Italian rain. It has been a matter of some controversy how a temporary covering could be stretched over so large a space without any intermediate props. The stone rings existing on the upper portions of the exterior wall round the theatre gives me reason to suppose that *they* were intended to support and hold the wooden masts to which the ropes carrying the awning were attached: there must have been considerable difficulty in keeping the awning stretched sufficiently tight, and we find that on windy days it was impossible sometimes to stretch them. As to the sprinkling of perfumes, Seneca tells us that "the perfumes were disseminated by being mixed with boiling water, so that the scent rose with the steam and became diffused throughout the building." Rimmel's patent vaporizer, therefore, introduced three years ago, at the pantomimes in all the chief theatres of London, was by no means a novel idea.

The Temple of Isis is a small but interesting building, standing on a basement in the centre of a court, round which is a portico of Corinthian columns, in brick, covered with stucco, and painted. In one corner of the court is an ædiculum with a vaulted roof, and pediment covering the sacred well of lustral purification, to descend to which there was a narrow flight of steps. Near it was an altar, on which were found the burnt bones of victims. On the south side of the inclosure were the chambers of the priests and a kitchen. In one room a skeleton was found holding a sacrificial axe, with which he had cut his way through two walls to escape from the eruption, but perished before he could penetrate the third. In another room a skeleton was found with bones of chickens and fish, egg-shells, bread, wine, and a garland of flowers, as if he had been beguiling away the last moments of his life merrily. Many other skeletons were found in the inclosure, testifying to the belief in the power of their deity.

A flight of steps leads to the temple, the front of which is a portico of six Corinthian columns, with niches on either side of the entrance to the cella, the interior of which is small; the entire width of the back, occupied by a long hollow pedestal for statues, having two low doorways at the end near the secret stairs, by which the priest could enter unperceived and deliver the oracles as if they proceeded from the mouth of the goddess herself.

Public Baths.

Two large establishments have been found in Pompeii. They are based on a similar system to the so-called Turkish baths lately introduced

in this country, and are remarkable for their admirable distribution.

The establishment first discovered behind the Forum is divided into three portions. The first containing the furnaces and fuel; the second, the baths for men; and the third, those for women. The two sets of baths were similar in arrangement, both heated by the same furnace, and supplied from the same reservoir. Each set had its apodyterium or disrobing-room, its frigidarium, tepidarium, and calidarium, and court with portico to the men's bath, only these latter were the largest and most rich. The apodyterium has seats of lava on either side. The clothes were hung up on pegs, the holes to hold which are still visible. The roof is vaulted in stone and rubble work, faced with stucco, and painted. It was lighted at one end by a window furnished with small panes of glass, ground, on one side, pieces of which were found on the floor. A cornice runs round the room, under which is an arabesque frieze in relief on a red and blue ground, composed of griffins, lyres, vases, dolphins, &c. A small recess at one end of this room is supposed to have been a wardrobe: at the opposite end is the entrance to the frigidarium, a room circular on plan, with a large cold-water bath in the centre, 12 ft. 10 in. in diameter, and 2 ft. 9 in. deep. The chamber is covered with a conical-shaped roof painted blue, the light admitted by a window in the side of it near the top. The walls are in stucco, painted yellow, and have four semicircular niches, in which are seats for the convenience of bathers. The cornice is decorated with bas-reliefs in stucco, on a red ground, representing Cupids and warriors engaged in a chariot race. The tepidarium, or warm bath, is entered from the frigidarium. It has a barrel-vaulted ceiling stuccoed, in low relief, with figures of flying genii and other ornaments, relieved on coloured ground, in medallions and panels.

The more remarkable portion of the decoration, however, is the series of niches divided by terra-cotta figures, representing Telamones or Atlases, who support the cornice. These figures and niches are at a height of 4 ft. 6 in. from the ground. The figures are about 2 ft. in height, stand on square plinths, and are similar in form to the giants of the temple at Agrigentum, which are supposed by Mr. Cockerell to have carried the roof. The object of these figures at Pompeii was simply to ornament the divisions of the niches, which we may suppose contained either the robes or the ointments and perfumes of the bathers. A brazier for coals, and two seats, all in bronze, were found, and still remain, in this room. The windows were awkwardly contrived. We next enter the vapour-bath or calidarium: it terminates at one end with a semicircular niche, containing a marble basin or labrum, 5 ft. in diameter: at the other end is the hot-bath, 12 ft. long and 2 ft. deep, in white marble. The ceiling is a barrel vault in brick, covered with stucco, and ornamented with a series of transverse fluting in relief. The walls are decorated with pilasters. The walls and floors in this room are hollow, to admit of the easy circulation of the hot air from the furnaces. The floors were of similar construction as those found in the Roman villas in this country, being carried by series of small pillars or piers formed of tiles, 1 ft. 5 in. in height, and about 18 in. apart. The walls are formed of tiles, held by cramps of iron, at a distance of 3 in. from the main wall, by means of small hollow pipes attached to these tiles, through which in fact the iron cramps pass. The women's baths are arranged on a similar system, being somewhat smaller and less rich in their decoration. The second establishment of baths, discovered in 1858, have a very large open court or palæstra, surrounded on three sides by a portico of fluted columns. The walls of the three sides under the portico are covered with paintings; and on the fourth side, there is decoration of a similar design, but executed in stucco relief. The baths were arranged and warmed on the same principle as the others.*

FALL OF A FLOOR AT WESTMINSTER.

ON Thursday night in last week, an accident of the most alarming character, by which nearly 100 men, women, and children were severely, and more than one fatally injured, happened at a Roman Catholic school-room, in Westminster. The Roman Catholic Chapel of St. Mary, Horseferry-road, has recently been repaired and redecorated; and, in order partly to meet the expenses, the priests belonging to that establishment got up a prize drawing, which took place in the St. Mary's school-room, Great Peter-street. This building, which is of L shape, consists of two floors, and it was the upper one which was selected for the purpose. It was capable of accommodating some 300 or 400 people, and the place appears to have been well filled. While the prize drawing was in progress, a large beam, which supported the centre of the floor suddenly broke in towards one end, and a part of the flooring, about 20 ft. by 18 ft., gave way, precipitating those who were standing or sitting upon it to the ground beneath. After some delay and great excitement, nearly 100 persons were got out, all of whom were injured more or less. Nearly sixty cases were taken to the Westminster Hospital, and of these thirty-eight were found to be casualties which included severe cuts upon all parts of the body, contusions, and some broken arms. There were some sixteen cases of broken limbs, injury to the spine, &c. An examination of the beam, which is about 14 in. square, showed, it appears, that it was a piece of wood which ought never to have been employed to bear a great weight. It was a knotty balk, of a particularly short cross grain, and very liable to snap, as it did. The wood was also to some extent affected by dry rot. The building was erected in 1857. The beam rested at each end about 4 in. on a set-off, and, as it seemed to us the day after the accident, when we examined the place, the ends were not pinned up. The rest of the floor is unsafe for a crowd, and should be taken down. About 500 persons were on the floor at the time of the accident.

At the Friday's meeting of the Metropolitan Board of Works, Mr. Miller, M.P., called attention to the accident, and moved that the architect be asked to report upon it. This was at once agreed to.

* To be continued.

COMPETITIONS.

Boston.—The committee of the Primitive Methodist Chapel, Boston, have awarded the premium to design (for new chapel) offered by Messrs. Bellamy & Hardy, architects, Lincoln. The works are to be immediately carried out under their superintendence.

St. James's Church, Denton Holm, Carlisle.—The committee of St. James's Church, Denton Holm, Carlisle, have received designs from competing architects from various parts of the country, and have awarded the first premium to Messrs. Andrews & Pepper, architects, Bradford, who are instructed to carry out the works.

PRIZES FOR ART WORKMANSHIP, SOCIETY OF ARTS.

THE following is a list of the prizes awarded. The judges were Messrs. Richard Redgrave, R.A., M. D. Wyatt, and John Webb:—

1ST DIVISION.

WORKS EXECUTED FROM PRESCRIBED DESIGNS.

CLASS 1.—CARVING IN MARBLE, STONE, OR WOOD.

(*a.*) *The Human Figure.*—Work executed in marble or stone, after the Boy and Dolphin cast from a chimney-piece, ascribed to Donatello. Four works sent in.—1st prize of 15*l.* to G. T. Sherborn, 59, Ponsonby-place, Millbank, S.W.; 2nd prize of 7*l.* 10*s.* to Alexander Kenmure, 43, Pancras-square, N.W.

(*b.*) *Ornament.*—Work executed in marble, stone, or wood, after a carved chair-back in the South Kensington Museum. One work sent in.—1st prize not awarded; 2nd prize of 5*l.* to James Stuart, 7, Pancras-square, N.W.

(*c.*) *Ornament.*—Work executed in stone, after a Gothic bracket in the Architectural Museum. Three works sent in.—1st prize of 10*l.* to T. V. Wran, 65, Lambeth-walk, S.; 2nd prize of 5*l.* to John Barker, 7, Draycot-street, Sloane-square, S.W.

(*d.*) Work carved in *wood*, after a design by Holbein. One work sent in.—1st prize not awarded; 2nd prize of 10*l.* to W. H. Baylis, 69, Judd-street, W.C.

(*e.*) Work carved in wood after the *Head of a Harp* of the period of Louis XVI. One work sent in.—1st prize not awarded; 2nd prize of 7*l.* 10*s.* to T. E. Mayle, 17, James-street, Camberwell-new-road, S.

(*f.*) *Ornament.*—Work carved in wood after an *Italian picture frame.*—No works sent in.

CLASS 2.—REPOUSSÉ WORK IN ANY METAL.

(*a.*) *The Human Figure as a bas-relief*; after *Raffaelle's "Three Graces."*—Four works sent in.—1st prize not awarded; 2nd prize of 5*l.* to W. Holliday, 14, Nailour-street, Islington, N.

(*b.*) *Ornament.*—Work executed after a Flemish salver in the South Kensington Museum. Three works sent in.—1st prize of 5*l.* to Septimus Beresford, 29, Myddelton-street, E.C.; 2nd prize of 3*l.* to H. R. Batchelor, 149, St. John-street-road, E.C.

CLASS 3.—HAMMERED WORK, IN IRON, BRASS, OR COPPER.

Ornament.—Work executed after a portion of the Pediment of a Gate (German work, date about 1700), in the South Kensington Museum. Three works sent in.—1st prize of 7*l.* 10*s.* to T. Winstanley, 10, Arthur-street, New Oxford-street, W.; 2nd prize of 5*l.* to J. Zobel, 139, Euston-road, N.W.; extra prize of 2*l.* to W. Letheren, Lansdown Iron Works, Cheltenham.

CLASS 4.—CARVING IN IVORY.

Human Figure in the Round.—After an *Ivory* by *Fiamingo.* Two works sent in.—No first prize awarded. Two second prizes of 10*l.* each awarded; one to J. W. Bentley, 22, Sherwood-street, Golden-square, W.; and one to John Richards.

CLASS 5.—CHASING IN BRONZE.

(*a.*) *The Human Figure.*—Executed after a reduced copy of "*Clytie.*" One work sent in.—1st prize of 10*l.* to T. Nichols, 4, Everilda-street, Hemingford-road, N.

(*b.*) *Ornament.*—Work executed after *Goutier*, from a cabinet in the possession of her Majesty the Queen.—Nine Works sent in.—1st prize of 10*l.* to R. E. Barrett, 26, Harrison-street, Gray's-inn-road, W.C.; 2nd prize of 7*l.* 10*s.* to H. J. Hatfield, 16, Alfred-street, Tottenham-court-road, W.C.

CLASS 6.—ETCHING AND ENGRAVING ON METAL—NIELLO WORK.

Ornament.—Work executed after arabesques by Lucas Van Leyden, 1528. Two works sent in.—1st prize of 10*l.* to Gilles Mackenzie, 12, Tudor-street, Sheffield. 2nd prize not awarded.

CLASS 7.—ENAMEL PAINTING ON COPPER OR GOLD.

No works sent in.

CLASS 8.—PAINTING ON PORCELAIN.

(*a.*) *The Human Figure.* After *Raffaelle's "Two Children,"* in the cartoon of "*Lystra.*"—Seven works sent in. No prizes awarded.

(*b.*) *Ornament.*—Executed after arabesques by Lucas Van Leyden, 1528. Two works sent in.—1st prize of 5*l.* to J. R. Evans, South-street, Mount Pleasant, Fenton, Staffordshire Potteries. No second prize awarded.

CLASS 9.—DECORATIVE PAINTING.

After an *ornament*, from *Castel R. Pandino*, near Lodi, from a drawing in the South Kensington Museum.—Two works sent in.—1st prize not awarded. 2nd prize of 3*l.* to John Henk, George-street, Stoke-upon-Trent.

CLASS 10.—INLAYS IN WOOD (MARQUETRY, OR BUHL), IVORY OR METAL.

Ornament.—Executed after a specimen in the possession of the Hon. John Ashley.—One work sent in (metal).—1st prize of 5*l.* to R. A. Millward, 35, Little Clarendon-street, Somers-town, N.W.

CLASS 11.—CAMEO CUTTING.

(*a.*) *Human Head.*—After *Wyon's* heads of the Queen and the Prince Consort, on the Jurors' medal of 1851.—Two works sent in.—1st prize not awarded. 2nd prize of 5*l.* to James Ronca, 156, King's-road, Chelsea, S.W.

(*b.*) *Animal.*—Work executed after *Wyon's "St. George and the Dragon,"* on the Prince Consort's Medal.—One work sent in. No prize awarded.

CLASS 12.—ENGRAVING ON GLASS.

No works sent in.

CLASS 13.—WALL MOSAICS.

Human Head.—After *Bertini*, of Milan.

General competition.—Three works sent in.—1st prize of 15*l.* to Samuel Cooper, Longfield-place, Hartshill, Stoke-on-Trent. 2nd prize of 10*l.* to G. H. Stevens, Lambeth Glass Works, Carlisle-street, S.

Female Competition.—One work sent in.—1st prize not awarded. 2nd prize of 10*l.* to Miss E. Mossop, Windmill-lane, Brentford, W.

CLASS 14.—GEM ENGRAVING.

(*a*). *Human Head.*—After an original in the possession of Mr. John Webb. Three works sent in.—No prizes awarded.

(*b. Full-length figure.*—After an original in the possession of Mr. John Webb.—One work sent in. 1st prize not awarded; 2nd prize of 5*l.* to John Wilson, 14, Leicester-place, W.C.

CLASS 15.—DIE SINKING.

Human Head.—After the head of the Prince Consort, by *Wyon*, on the Society's medal. Five works sent in.—1st prize not awarded; 2nd prize of 5*l.* to John Hatchett, 5, Gloucester-terrace, Kennington-park, S.

CLASS 16.—GLASS BLOWING.

No works sent in.

CLASS 17.—BOOKBINDING AND LEATHER WORK.

Bookbinding.—After an Italian specimen in the South Kensington Museum.—One work sent in.—1st prize of 7*l.* 10*s.* to Louis Genth, 15, Broad-court, Bow-street, W.C.

CLASS 18.—EMBROIDERY.

No works sent in.

2ND DIVISION.

WORKS EXECUTED WITHOUT PRESCRIBED DESIGNS.

WOOD CARVING.

(*a.*) *Human Figure in alto or bas-relief; animals or natural foliage may be used as accessories.*—Twelve works sent in. No first prize awarded. 2nd prize of 15*l.* to Mark Rogers, 111, Tachbrook-street, S.W., for a carving, "Spring;" a child's head. 3rd prize of 10*l.* to James Griffiths, 8, Addington-place, York-road, S., for a carving, "Cain preparing his Sacrifice." Extra prize of 8*l.* to T. W. Wallis, Louth, for a carving of a child's head, "Hope for the Future."

(*b.*) *Animal or Still Life. Fruit, flowers, or natural foliage may be used as accessories.*—Five works sent in.—2nd prize of 7*l.* 10*s.* to T. Wallis, Louth, for a carving of "Wagtail and Fly." 1st and 3rd prizes not awarded.

(*c.*) *Natural Foliage, Fruit, or Flowers, or conventional ornament in which grotesque figures or animals may form accessories, preference being given where the work is of an applied character for ordinary decorative purposes, as representing commercial value.*—Nine works sent in. No first or second prizes awarded. Two third prizes of 5*l.* each awarded; one to George Murray, 6, Claremont-place, Henderson-row, Edinburgh, for a carving of a frieze; and one to W. M. Holmes, 101, Dean-street, Soho, W., for a tripod-stand. Extra prize of 3*l.* to George Lock, 26, Albert-street, Camden-town, N.W., for a carving of festoons of flowers.

An extra prize of 5*l.* to Gerrard Robinson, 14, Duke-street, Manchester-square, W., for carvings of the human figure in the round.

INTERNATIONAL COMPETITION: PALACE FOR THE STATES GENERAL OF THE NETHERLANDS.

THE following letter speaks for itself:—

SIR,—A new palace, for the accommodation of the States General of the Netherlands, is to be built at the Hague, open to public competition of all countries.

I have been specially requested by my Government to send to you a couple of the programmes for that proposed building, with the view of making such use of it as you may think best for the information of British Architects.

I have the honour to be, &c.,
BARON BENTINCK,
Minister of the Netherlands.

We have placed a copy of the programme at the Office, in York-street, where it may be consulted. We may state briefly, that the edifice is to include two Chambers,—the cost, exclusive of foundations, is not to exceed 1,000,000 of florins of the Low Countries; the author of the selected design will be entitled to a premium of 2,500 florins; the minister reserves the right of buying, at the sum of 1,000 florins each, any of the other designs which are distinguished by happy combinations or excellence of execution; the selected design is to be made use of as the minister thinks fit; the designs are to be sent in by the end of June.

"COMPETITIONS AND THE ALLIANCE."

SIR,—The periodical correspondence on this subject having just appeared, I send you a copy of the circular, which I send every Saturday morning to the managers of all competitions advertised in that day's *Builder*, and any more I can hear of. If any of your readers will send me the advertisements of any others, they shall be similarly favoured. I *know* that the circular has done good in some cases, and *hope* it has in all. Trusting you will be able to find room for it, I am, Sir, &c.,

J. P. PRITCHETT, Hon. Secretary to the Alliance.

"THE ARCHITECTURAL ALLIANCE,

Embracing the following Architectural Societies:—

1. London Architectural Association.
2. Architectural Institute of Scotland.
3. Birmingham Architectural Society.
4. Bristol Society of Architects.
5. Glasgow Architectural Society.
6. Liverpool Architectural and Archæological Society.
7. Manchester Architectural Association.
8. Northern Architectural Association.
9. Nottingham Architectural Association.

Sir,—In consequence of your advertisement asking for designs to be submitted in competition for ——, I am instructed, as hon. secretary for the Architectural Alliance, to offer for your consideration the views of the Allied Societies on the subject.

Assuming that competition as an abstract principle is good, the working out of an architectural competition is so fenced round with difficulties, that the greatest care is requisite to prevent injustice to competitors on the one hand, and disappointment to promoters on the other hand; and feeling sure that you wish to avoid both these evils, the Allied Architectural Societies presume that you will not object to profit by their experience in bringing the matter to a successful issue.

The chief desiderata in every competition must necessarily be—

1st. Clear and precise conditions and instructions for the guidance of competitors.

2nd. A strictly honourable adherence to such conditions and instructions both by the promoters and competitors.

3rd. The offer of remuneration sufficient to induce men of talent and experience to compete.

And lastly. Provision for a competent and impartial adjudication of such remuneration.

The conditions and instructions should lay down—

A. Either the exact accommodation required and the *approximate* outlay intended, leaving it to the competitors to send a definite estimate; or the exact outlay intended and the *approximate* accommodation required, leaving it to the competitors to decide the amount of accommodation they can provide for that outlay.

If *both* the accommodation and outlay are fixed, the estimate is manifestly the work of the promoters, not of the competitors.

B. The drawings to be submitted should be fixed, as follows, being what are usually requisite:—A plan of each floor; two sections (one longitudinal and one transverse) of each building; two elevations of each building, and perspective drawings and details, at the option of the competitors.

The plans should have the walls coloured with Indian ink, sepia, or neutral tint, with the floors coloured yellow or brown, to show whether of wood or of stone.

The sections and elevations should be either in outline, or coloured, to show the different materials proposed; no shading to be used, except flat shadows in the windows.

The perspective drawings should be either in outline, or etched in black or brown ink, or shaded with Indian ink or sepia; no colour to be used.

Detail drawings should be coloured to show the materials proposed, but no shading to be used.

All drawings to be mounted on strainers, but without frames or glass.

The scale of all drawings, except details, should be fixed at $\frac{1}{8}$ in. to the foot, if the ground-plan will come in a sheet of paper 52 in. by 30 in.: if not, a smaller scale, to enable it to do so.

C. A plan of the site, the same or half the scale that the designs are required to be, should be furnished to competitors, together with sections, if the ground is not level.

If the required designs are for the alteration or enlargement of existing buildings, plans, elevations, and sections of such parts as are expected to work in with the new buildings should also be furnished.

D. It should be made a distinct condition, supposing our suggestion *A* to have been followed out, that unless a tender is received from a competent builder to execute the works for the amount of the architect's estimate, the promoters may be at liberty to abandon the design on payment of a moderate sum to the designer (say $1\frac{1}{4}$ per cent. upon the amount of his estimate), to cover what he may be actually out of pocket, and to proceed with the next design in order of merit; and should no tender be received at or about the amount of estimate (say within 10 per cent.), this course should be adopted.

The promoters should distinctly state that any competitor violating the conditions by sending any coloured perspective drawings, or any drawings framed or glazed, will be excluded from the competition, and his plans will be at once returned to their author—not merely that such *drawing* will be excluded, as it may accomplish the designer's object by creating an exalted impression of the design before it is excluded; and in all other matters the promoters should strictly adhere to the conditions, and should give competitors to understand that they will do so, which will not fail to produce an honourable response on the part of competitors.

It is manifest that when architects are asked to compete, the remuneration to the successful competitor should be more than he would receive were he commissioned to carry out the work without a competition; and also that there should be some slight acknowledgment to the next one or two designs about whose merit as compared with the one adopted there may have been a difference of opinion.

It is, therefore, clear that there should be a premium for the best design in addition to the commission for carrying out the work, and that there should be moderate second and third premiums.

But above all, the question, an answer to which decides men of ability and experience whether to compete or not, is,—Will the author of the selected design be employed to carry out his design at the usual rate of remuneration?

No matter how fair the premium, it barely remunerates the receiver of it for the expense and trouble he has been at in preparing his drawings, irrespective of the skill required for designing the building; and is, therefore, by itself, no *premium*, but merely moderate pay to one competitor only out of a large number for a part of the work done. Competitors look to the commission as their real remuneration, and consider the 'premium,' as the term implies, an extra payment for the extra trouble and anxiety of competing.

It should, therefore, be an invariable condition that the author of the selected design should be employed to carry it out at the usual rate of remuneration, should he be a person of sufficient experience to warrant the promoters in entrusting the work to him.

The proper award of the premiums is the most difficult question connected with competitions; but its paramount importance demands that an attempt should be made to grapple with it.

In competitions for small works the selection must necessarily rest with the promoters, who should appoint a sub-committee to select and report to the general body.

In works involving an outlay of 2,000*l*. and upwards, it seems desirable to secure a more experienced tribunal than a committee afford; that is to say, to refer the matter to one or two architects of admitted experience, honour, and discretion.

The award of the adjudicator, whether appointed as above suggested or otherwise, to be final and conclusive.

Hoping you will find these suggestions of service to you, I am, Sir, &c.

9, Conduit-street, Hanover-square,
London, W."

THE ARCHITECTURAL ASSOCIATION.

THE usual meeting of the Association was held on Friday evening (the 20th ult.), at the House, in Conduit-street. The chair was occupied by the president, Mr. J. H. Christian.

Mr. Edward J. Lowther, of High-street, Stoke Newington, and Mr. R. S. Wilkinson, of Weighton House, South Penge Park, were elected members of the Association.

Mr. R. Phéné Spiers then read a paper "On Pompeii," which we give elsewhere.

At the conclusion of the paper,

Mr. Spiers stated, in reply to questions, that with the exception of two instances, he had not observed any cases in which gardens were attached to Pompeian houses. The reason probably was, that as the inhabitants passed the greater portion of the day in the open air, and that from the peculiar position of the city (built on the volcanic rocks of the Campania, washed on nearly two sides by the sea, and commanding from almost every point the most picturesque views), it was considered unnecessary to provide that which in England would be regarded as a great attraction to a gentleman's residence. With regard to baths, two large establishments, on a similar system to the Turkish baths lately constructed in this country, had already been disclosed. That first discovered was behind the Forum, and was divided into three portions. The first contained the furnaces and fuel; the second the baths for men; and the third those for women. The two sets of baths were similar in arrangement, both being heated by the same furnace, and supplied from the same reservoir. Each set had its apodyterium, or disrobing-room; its frigidarium, tepidarium, and calidarium. The clothes of the bathers were hung on pegs, the holes into which they were fixed being still visible. The frigidarium was a circular room, with a large cold-water bath in the centre, 12 ft. 10 in. in diameter, and 2 ft. 9 in. deep. In the tepidarium adjoining, a brazier for coals, and two seats, all made of bronze, were discovered, and still remained. The fact that the Pompeians were familiar with glass was also established, in this case beyond doubt, as the baths were lighted with small windows, glazed with glass ground on one side, the fragments of which were found in the building.

The description of the baths having suggested the "sweating system," a member inquired whether Mr. Spiers had traced any tailors' shops.

Mr. Spiers replied that he had not, as the business of a tailor could be carried on almost anywhere. The Pompeians did not, however, hold the tailors in very high repute, as they were ranged in the Forum very high up, and were generally a noisy and obstreperous lot. They were not allowed to look at the Pompeian ladies of the higher order, who had a gallery of their own in the Forum, and viewed the performances through a *grille* of metal-work, somewhat similar to that through which ladies in our own day are permitted to enjoy the exhibition presented in the House of Commons. With regard to the supply of water and drainage, although abundance of earthenware and metal pipes had been found in Pompeii, the source of water-supply had not been traced; neither did there appear to be any provision for carrying off the more solid sewage. Possibly the streets were the only drains, as in Eastern towns; and these might have been flushed occasionally by the tremendous showers with which Italian towns are sometimes visited. He had not been able to trace any remains of public lamps, although he had found (and produced) scraps of

iron. The Pompeians used bronze largely in fine art productions, but the use of iron appeared to have been restricted to works of construction only.

Having described the manner in which the plaster for fresco-painting was prepared, and exhibited specimens with the colours still fresh, Mr. Spiers stated that he hoped to revisit Pompeii in the course of the present year, and, on his return, to contribute some further information on the subject to the Association.

In proposing a vote of thanks for this paper,—

The Chairman said, with regard to the architectural features of the city, but little scope appeared to have been left to the architects of those days, except in the construction of the temples, theatres, and other public buildings; as the private houses and shops, though very beautifully ornamented with coloured marbles, presented no great field for the higher qualifications of the architect. In many instances the chambers of the private houses were decorated with paintings, in fresco, of buildings, or rather outlines of buildings, that might be taken as representing iron architecture. He did not, however, believe that the Italians of the period were familiar with the use of iron for structural purposes; and he fancied that the drawings to which he referred were the outlines of buildings suggested to the eye of the artist, and had no reference whatever to any existing structures composed of iron.

REREDOS IN PRESTWICH CHURCH.

A richly-sculptured reredos has just been erected in this church by the rector, the Rev. H. M. Birch, and Mrs. Birch. The style is in accordance with the architecture of the church, viz., that known as the Perpendicular. The material of which the reredos is principally executed is Caen stone. It consists of five canopied niches, enriched with carved crockets and pinnacles. The three central niches contain a sculptured representation of the "Last Supper," in alto-relief; and the remaining two, "The Agony in the Garden," and "The Three Marys at the Sepulchre." In addition to the sculptured subjects, there is a large panel at each end; these extend from the base up to the cornice, and contain marble tablets, on which are engraved the Ten Commandments, the letters and ornamental embellishments being painted in various colours. The circumstance to which the church is indebted for this handsome work appears from the following inscription, which is engraved on a brass plate, and fixed behind the communion table: "To the Glory of God and to the Memory of Henry Arthur Drinkwater, their first-born and fondly-loved child, who died of scarlet fever, April 25th, 1863, in his eighth year, this Reredos is dedicated by his bereaved parents Henry Mildred and Harriet Julia Birch." Mr. W. Smith was the architect; and Mr. James Forsyth, of London, was the sculptor.

DWELLINGS OF THE LABOURING CLASSES.

The committee appointed by the Society of Arts with the view of instituting an inquiry, to ascertain if anything can be done to remedy or to mitigate the evils arising from the want of proper dwellings for the labouring classes, has divided itself into three sub-committees, to proceed simultaneously with various parts of the subject. On the 27th ult. the sub-committees 1 and 2 met; present, Mr. W. Hawes in the chair, Alderman Waterlow, Mr. Bosanquet, Mr. Le Neve Foster, Dr. Greenhill, Mr. Gatliff, Mr. Godwin, Mr. Martin Ware, who is acting as secretary to the committee, and others. The sub-committees discussed jointly at considerable length "the best mode of lessening the burdens on house property of the working classes." The committee includes the names of Messrs. Dyke Acland and Akroyd, Lord Belper, Lord Berners, Duke of Buccleuch, Messrs. Chadwick, Chester, and Cole, Right Hon. W. Cowper, Mr. J. Bailey Denton, Earl Ducie, Lord Ebury, Mr. Hare, Earl of Harrowby, Messrs. G. W. Hastings and C. Wren Hoskyns, Dr. Lankester, Marquis of Lansdowne, Lord Talbot de Malahide, Messrs. M. H. Marsh, M.P., H. Maynard, J. Stuart Mill, and J. Chalmers Morton, Earl of Shaftesbury, Sir J. Kay Shuttleworth, Lord Stanley, M.P., Mr. Twining, the Duke of Wellington, and several others.

THE ARCHITECT OF THE CHURCH OF ST. OUEN, ROUEN.

Sir,—In the notice kindly given to my little book, styled "Normandy, &c.: a Sketch" (*Builder*, No. 1146), you ask for the authority for a statement with regard to A. Berneval, one of the architects of the church of St. Ouen, at Rouen, which describes him as "*architect and clerk of the works.*" Having destroyed the notes used while compiling the text in question, I cannot now refer to the authority for the words which are italicised above. Allow me to say that they appear in the text as a quotation,—between inverted commas,—and not as a positive statement of my own opinion. Finding these words so placed indicates to me that I did not consider them beyond question. The position of Berneval is best defined by the inscription on the tomb in St. Ouen, placed there by the monks in consideration of his abilities and services. This is thus given by Pommeraye, "Histoire de l'Abbaye de St. Ouen, 1662:"—"*Ci git Mr. Alexandre de Berneual, maistre des œuures de massonnerie au Baillage de Rouen et de cette Eglise, qui trépassa l'an de grace* 1440, *le* 5 *Januier.*" In another place Pommeraye speaks of him as "*architecte et conducteur des travaux de l'Eglise de St. Ouen.*"

With regard to the photographs which my text was intended to illustrate, let me say that they were not made under my direction, either as concerns their subjects, size, or the points of view chosen for them. F. G. Stephens.

THE SEWAGE QUESTION.

The Sewage Committee, in their report, have embodied their opinions in the following paragraph:—

"We recommend that the important object of completely freeing the entire basins of rivers from pollution should be rendered possible by general legislative enactment, enabling the inhabitants of such entire districts to adopt some controlling power for that purpose; but it should include a provision for compelling local Boards to render the sewage of their districts innocuous by application to the land for agricultural purposes. The case of the valley of the Thames (where the purification of the river has been sought by the expenditure of enormous sums, is, to a considerable extent, counteracted by the increased discharge of sewage from towns higher up the stream) requires special and immediate attention."

Dr. Ackland, of Oxford, who has for some time advocated the necessity of appointing some authority to control the catchment basins of rivers, presented a memorial, in conjunction with other gentlemen, to Sir George Grey two years since, with respect to the particular catchment basin of the Thames. The evidence he gives in the report of the condition of the river near Oxford is certainly disgusting. He states that in one place the deposits of sewage have diminished the depth of the river by 6 ft.

Mr. Rawlinson, the principal inspector in the Local Government Act Office, who has inspected the rivers of Lancashire and parts of Yorkshire, says—"they are fouled almost from source to estuary." The rivers Irwell, Medlock, Irk, and Bridgwater Canal are more offensive from sewage than the Thames. The Medlock at Manchester is covered with a black scum so thick that birds are able to walk over it! The rivers and streams in Lancashire and Yorkshire are fearfully abused. There are river beds in Lancashire and Yorkshire that are raised 10 or 15 ft. by sewage, ashes, and other refuse. The want of some central authority to deal with the watersheds of districts is illustrated by the case of Salford. The inhabitants of this town wished to carry their sewage by tunnel three or four miles from Manchester at an expense of 80,000*l.*, but were prevented from doing so by the refusal of other towns to co-operate. "Of what use is it," they say, "to expend large sums when Manchester and all the other towns above will continue to foul the river?"

Baron Liebig, the President of the Royal Academy of Science at Munich, has forwarded to the Lord Mayor of London a communication, which would probably occupy four or five columns of a newspaper, and which was evidently intended for national circulation. Leaving untouched the sanitary, engineering, and agricultural questions connected with the sewage, for the reason that they had already been profoundly investigated by the Select Parliamentary Committee over which Lord Robert Montagu presided, Baron Liebig, in the document in question, aims at putting in their proper light before the farmers, the inhabitants of towns, and the legislature, the facts and principles which he thinks ought to be taken as guides in any estimate of the worth and importance of sewage. The document is written in English throughout, and that is its key-note. The Lord Mayor convened a special Court of Common Council the day after the receipt of the communication, in order that he might lay it before that body, which has of late taken a prominent part in relation to the utilization of sewage. The result was that Baron Liebig's communication was referred to the Coal, Corn, and Finance Committee, to be printed and circulated forthwith among the members of the Common Council.

SANITARY MATTERS.

Woolwich.—At a recent meeting of the Local Board of Health, a letter was read from Dr. Simon, F.R.S., medical officer of the Privy Council, requesting to be informed what steps had been taken by the Board to carry out the recommendations of Dr. Bristowe, who had been specially employed by the Privy Council to make an inspection of the town with reference to the frightful epidemic which recently prevailed. Dr. Bristowe, in his report, strongly recommended the advisability of connecting the sewerage system of the district with the tall shaft at the steam factory department of the dockyard: and it was now stated that the local Board had applied to the Admiralty for permission to carry out the plan proposed, but that some objections had been made, which, it was believed, could be obviated. A reply to this effect was ordered to be forwarded to the Privy Council.

Glasgow.—At the last fortnightly meeting of the Police Board it was reported that during the previous fortnight 376 cases of fever had been announced, as against 312 cases during the fortnight before. Mr. Ure said it would be observed that this was the greatest ever reported to the Board. It is proposed to take on lease for a fever hospital, premises in Main-street, Anderston, at a rental of three years for 400*l.*, and if for five years, at 350*l.* sterling per annum.

Ireland.—Disease is very prevalent in Ireland at present. There is not a town almost where fever is not raging.

SOUTH LONDON WORKING CLASSES' EXHIBITION.

The second South London Exhibition, at the Lambeth Baths, was opened on Wednesday, with some *éclat*. The Bishop of Winchester presided, and the Hon. W. Cowper, M.P., Mr. John Locke, M.P., Dr. Newman Hall, the Hon. A. Kinnaird, M.P., Mr. Doulton, M.P., Mr. Lucas, and Mr. F. Fowler addressed the meeting. Dr. Hall's speech was remarkably effective. To the exhibition itself we may return. Suffice it to say at present, the number of exhibitors is 633.

The space used for the purposes of the exhibition is about 5,000 square feet of hanging space, 1,200 ft. run of table space of various depths, and 800 ft. of floor space.

IPSWICH TOWN HALL.

The town council, after a long and cross debate, have determined not to patch up the old hall, and, in building a new one, not to join with it the museum, as originally intended. They further referred it to the Estate Committee, to obtain a design. In what way the Committee are to set about this, however,—whether they are to put aside altogether the previously selected competitors, invite a fresh competition, or name an architect themselves,—did not appear. Having again determined on having a new building, it is to be hoped the members of the town council will now put aside their different crotchets, and work with something like unanimity towards the one end in view.

Opening of a Russian Tumulus.—An interesting discovery has just been made in a tumulus at Ekaterinoslaw, in Russia. It consists of a treasure which formerly belonged to a chief of the Huns. Among the different articles is a heavy gold diadem, in which is set a cameo of amethyst of ancient Roman workmanship; also a large collar, bracelets, and drinking cups, with handles formed by animals, the whole of which are in gold of remarkable workmanship.

MASTERS AND MEN.

SIR,—Although the "discharge note" has gone by, I shall be glad to say a few words in reply to your correspondent, "A Joiner." This writer designates the complaints of the masters, as expressed by the chairman of the Builders' Association, as "a farrago of nonsense," and "the talk about the dictation of operatives as mere bosh." I shall be happy to hear that the workmen in a "A Joiner's" locality, know better what belongs to their position, and have the good sense to allow the masters to use their own discretion in the management of their business; but if the masters in that favoured locality, and very probably in many others, enjoy this privilege, it is too patent to be denied, in the off-hand way "A Joiner" does it, that dictation by the workmen does take place to a great extent in most of the large towns. I, therefore, conclude that "A Joiner" has not travelled far, or if he has, he must have wilfully shut his eyes. Let "A Joiner" read the letter of J. Radford, who, judging from a previous letter, is no particular friend of the masters. The letter appeared in the *Birmingham Daily Post*, of the 19th ult., in which there are references to dictation of the workmen, which are something more than "bosh." If "A Joiner" has not wilfully shut his eyes, he would, even in the *Builder*, have seen recorded some instances of presumptuous dictation; but I fear that "A Joiner" has those exaggerated views of workmen's rights, that he cannot see that he is claiming more than is reasonable, and therefore cannot understand what dictation is. If so, I will just ask him to consider what he would expect if he were in the position of a master: the masters generally wish no more, nor, perhaps, so much as he would claim. I shall be glad to find that workmen generally do improve their minds by the acquisition of valuable information. Only let them use it fairly and honestly, or it will be like the education of dishonest men, doing greater mischief in proportion to the amount of knowledge possessed; and let me say that the workman who can best serve the master is the educated one. Such a one can serve his master and himself too, and as opportunity offers, raise himself to a higher position without injury to his master; but, in order to do this, the workmen must shake off the chains of slavery which the trade-unions would bind upon them, in forbidding their trying to better themselves by piecework, over-time, &c. The workmen do themselves no good by harbouring a jealous fear lest the masters should get a shilling too much out of their labour: that man will generally succeed best who is willing, faithful, and trusting, and, when his time comes, will make the best master.

Whatever "A Joiner" may say to the contrary, and by whatever choice epithets he may term the statements to the contrary, it is too true that the workmen have by their unions usurped a power in interfering with the rights of the masters, who have hitherto and too long delayed to make efforts by union among themselves to check the monster evil. I am therefore glad that masters generally now see the necessity of union: experience will soon dictate the best mode of meeting such cases as may arise. I do sincerely hope that the workmen will agree to a set of rules which shall prevent any further dispute, and put the masters in such a position that they may always know what wages they have to pay. A. B. C.

Several correspondents urge the appointment of a committee of masters and men to arbitrate, a proposition now before the trade. One, "W. Gascoyne, Builder," writes,—"I feel sure, from my own experience, that great good would result by trying to settle differences by reason instead of force. I must think that if the workmen saw themselves properly represented by their fellows, and any questions affecting them fairly discussed, with the usual amount of common sense which they possess, they would, on the other hand, allow in all fairness a full discussion and an impartial hearing of any question also affecting the employers. One great fact must be admitted, that is, that in a commercial point of view, the labour is as valuable as the capital which is paid for it; therefore, I think, if both are fairly represented at this conference, there could be no cause of complaint. I feel sure that if both parties were brought together in this way both would have better faith in each other, for both are equally dependent on each other. For example, the workmen would be then represented by a body of sober, sensible men, who would listen to reason; instead of, as now, in many cases where a complaint exists, some one or two who can talk well, and do not mind mounting a platform, carrying them away and often compelling them to strike; and, the more agitation there is in many cases, the better it answers their purpose,—forgetting the principle which is involved. Now this I wish most sincerely to see done away with, and am prepared to do all in my power to assist; and I shall be happy, if this plan is thought the right one, to co-operate with any one, and shall be most happy to hear the views of any one on the subject. I may say that, amongst the men in my employ, who number upwards of one hundred and forty, that I have spoken to upon this plan, they seem all to approve of it."

THE BUILDING TRADES MOVEMENT.

IN consequence of the public announcement that the masters had renounced the "discharge note," the operatives' secretary wrote to the masters' secretary, asking for an interview between deputations from both bodies; and, that interview being granted, the meeting took place. The interview was of nearly two hours' duration, and matters were discussed in a friendly spirit on both sides. In reply to the men, the masters gave an assurance that the "note" had been unconditionally withdrawn. After a lengthy conversation, the following conclusions were arrived at:—That the masters shall meet by themselves, to agree upon such rules for the regulation of the trade as they may deem suitable; and that the men shall meet and agree upon such rules as they may deem suitable; that early in the following week an equal number of masters and men, appointed by their respective bodies, shall meet to discuss these rules; that in case of dispute each side shall choose a referee, and that the referees so chosen shall choose an umpire whose decision shall be final; and, lastly, that the rules so agreed upon between the representatives of the masters and the representatives of the men shall be binding upon the whole trade, both masters and operatives. It seemed to be generally agreed upon that all previously existing rules were now null and void, awaiting remodelling at the hands of the forthcoming conference.

At a meeting of delegates from the various carpenters' societies and shops in London, it has been resolved;—"That, in the opinion of this meeting, it would be advisable to convene a conference of the whole of the building trades throughout the country as early as possible, for the adoption of a code of rules for regulating the trade, and the appointment of a committee to lay those rules before the representatives of the masters' associations for mutual discussion, and with the object of having all future disputes settled by arbitration."

A meeting of the delegates of the different branches of the building trades has also been held at Nottingham, to confer with the masters for the purpose of adjusting the difference in dispute between the master and operative builders, and to decide upon the trade rules. At this meeting, Mr. Slinn suggested that if on any question there was an equal number of votes for and against, that particular subject should be left for arbitration. Mr. Ellis observed, that any decision that might be arrived at that evening would not be final, as it would have to be submitted to the different societies before it could be binding upon them. A long conversation then ensued, in which the delegates took part, as to the reason that the men were still out on strike. Mr. Hicken (operative) said it was undoubtedly because the secretary did not say in his note that the shops were now open for the men to return to work as before the disagreement. At the conclusion of a lengthy discussion, the following resolution was proposed by Mr. Ellis (master), and seconded by Mr. Hickin (operative), and adopted unanimously:—

"That we, as delegates, recommend to our societies to adopt a court of arbitration, consisting of one operative and one master from each branch of the building trade; and that we communicate the same to Mr. Wheeler (the masters' secretary); and, if accepted, that an equal number of employers and employed revise their rules if they require it. Should any dispute arise, the arbitration court to settle the same. And, further, that each town shall have its own delegates, and settle its own questions in its own court of arbitration."

This resolution was agreed upon unanimously.

At a similar meeting in Coventry the following resolution was unanimously agreed to:—

"That the masters and men connected with the building trades of Coventry in public meeting assembled respective'y and mutually agree to the following resolutions:—

1. That they will respectively appoint delegates to frame the rules under which each of the building trades of Coventry shall be carried on, the rules for each trade being framed by the masters and delegates of that trade.
2. That those delegates shall appoint a chairman, who shall have the casting vote.
3. That the masters on their part and the operatives on their part respectively and mutually promise to abide by and carry out all rules which may be agreed to by the delegates or decided by the casting vote of the chairman.
4. That the following persons be appointed delegates for the purposes above mentioned."

A list of delegates followed. It was then suggested that the men should at once resume work; but, as some one demurred to this, it was decided that the men would consider the question, and give the masters an early answer.

While the whole of England has been ringing with the protests of the operatives against the employers in the Midland district in seeking to enforce the "discharge note" system; and the cry of "Down with Dictation" became so strong and unanimous that the employers wisely determined to abandon their intention of enforcing the note; we regret to find that a portion of the operatives have already taken such an ill-advised and childish step as to dictate to the Liverpool masters, that after the expiration of another six months they shall use no bricks made by steam power! The following is a copy of a circular sent to the employers:—"To Master Builders, Contractors, and Others.—Upon consideration we, the undersigned hereby give you *notice that there will be no more bricks used made by steam power on and after the 22nd July*, 1865, as the brickmakers of Birkenhead and its vicinity can supply you with as good an article, if not superior, to the ones now made by steam power, with the exception of white and blue fire-bricks. By order of the Committee of Management of the Amalgamated Bricklayers, Bricklayers' Labourers, Brickmakers and Plasterers." Here we have proof that no experience is of any avail in the removal of stupid errors such as that which would have prevented this country from becoming "the workshop of the world,"—which it never could have been but for the unrestricted extension of steam-power. When the cotton manufacture was in its infancy, all the foolish old women in the country railed against the use of steam in spinning and weaving because it would lead to the substitution of machinery for hand-labour, whereas it has provided labour and livings for hundreds of thousands; and of late, from war in America, thousands have been starving from the unavoidable suspension of steam-power. The foolish and impracticable dictum of the Liverpool bricklayers is just a reproduction of the absurdity which characterised the cotton operatives themselves, when they struggled against the introduction of the steam-loom, and of the folly of stage-coach drivers who opposed the construction of railways. The amalgamated bricklayers, bricklayers' labourers, and brickmakers and plasterers are grievously mistaken if they imagine that their dictation will prevent the manufacture of bricks by steam; and in this struggle with the employers they must not count on the support of the press and the sympathy of the public.

At the last ordinary meeting of the Liverpool Architectural and Archæological Society, Mr. Wylie drew attention to the notice. He said it was important that they should at once protest most decidedly against such dictation, because the time had arrived when machine-made bricks, both moulded and plain, would be far more extensively used than they had ever yet been. They should not lose sight of the fact, that attempts were formerly made to put down machinery in all its branches of manufacture. He could quote a number of instances in which, instead of machinery having been a disadvantage to skilled labour, it had been of the greatest advantage; and he believed that without machinery we could not in the present day carry on such immense operations in trade and commerce in this country as we did: therefore, the attempt of those individuals to put down machinery in the making of bricks appeared to him to be one of the most suicidal steps in which they could be engaged. He thought that, as a society of professional men, they should immediately protest against the adoption or reception of such obsolete ideas. The dictation, if allowed, would prove very serious, and would affect a great number of buildings which were now in course of erection. He characterised the conduct of the men as most absurd.

With regard to a notice sent in to the Wigan masters of a demand of 10 per cent. increase of wages by the Wigan bricklayers, a member of

the largest firm of employers in the town—Messrs. Fanclough & Son—calls upon the trade to "set their faces against this annual nuisance of notice for a never-ending increase of wages, which the men will find eventually ruinous to themselves as well as the trade, as people will be driven to invest in more lucrative forms than in building."

MARSEILLES.

MARSEILLES, keeping pace with modern improvements, has opened a magnificent *Rue Impérial*, a colossal *préfecture*, a magnificent *palais de justice*, a museum which promises to be a wonder, and has organized a company of docks and warehouses worthy of the principal port in the Mediterranean. It appears, however, that the celebrated corporation of porters or *portefaix* of Marseilles, who for centuries have had the privilege of the carriage and storage of merchandise on the principal quays, looked upon this institution of the docks with no small jealousy. The docks (described on another page) offered to commerce the advantages of celerity, security, commodiousness, and economy, which the system of porterage could not give. Hence, a war broke out between the Corporation and the Dock Company; the former being called anti-progressionists, and the latter monopolists. The dock proprietors offered work to the porters, which some, foregoing the freedom of the corporation which they had possessed, accepted. These were at once deprived of all rights to municipal succour in case of old age or present infirmity, and the excitement became so great that the town garrison was obliged to be reinforced. It is plain that the Dock Company can have only a moral monopoly, such as railways now possess with regard to mail coaches; and it is still more certain that, if the inhabitants of Marseilles do not, by the proper extension of docks, keep pace with the demands of modern commerce, merchants will find it their interest to discharge their cargoes at some other port, such as Genoa or Trieste.

LIVERPOOL.

The new Municipal Offices, Dale-street.—This building is now far advanced towards completion. The style is Grecian, of the Corinthian order, and the building will have a north frontage of 222 ft. to Dale-street, which will be the principal front; while it will run back to the distance of 195 ft. in Crosshall-street and Sir Thomas's-buildings. The basement floor will contain four suites of rooms, in addition to several other apartments for storage, gas-metre, lumber-room, &c. This story will have four separate entrances from the south front, and there will be an entrance east and west from Crosshall-street and Sir Thomas's-buildings respectively. This floor will be lighted by windows on each side of the building. The north front to Dale-street will be the principal front of the building. The external walls are all of Minera stone, brought from Berwig quarries, near Wrexham. The principal entrance will be in the centre, and there will be a portico and six columns—three on each side of the doorway—with Corinthian capitals. Over the entrance will be cut in large letters, "*Deus Nobis hæc Otia fecit*," and immediately above a double-arched window, which will give relief to the appearance of the front. Above this will rise a circular tower, in which a large clock will be fixed. The elevation of this tower, including the spire, will be 140 ft., while the main portion of the building to the eaves will be 62 ft. high. All the offices for public business, at the Town-hall, at Cornwallis-street, at Hotham-street, &c., will be on the ground-floor in this building. Although the exterior walls are of stone, a small portion of the south front is of patent red brick, and will not have the advantage of such elaborations in architectural design as have been expended on the front to Dale-street. The windows all round the building will have polished granite pillars on each side, and the various entrances will be in strict keeping with the design. The walls, both inner and outer, will be from 2 ft. to 4 ft. thick, in addition to the columns, and in some places they will be 4 ft. 10 in. thick. Mr. Weightman, the borough surveyor, is the architect; and the contractors for the mason-work are Messrs. John Parker & Son; for the brickwork, Messrs. Holme & Nicol; for the joiners' work, Messrs. Haigh & Co.; and the clerk of the works is Mr. J. Crierie, under whose superintendence the Public Library was built.

New Wesleyan Schools in Toxteth Park.—The foundation-stone of new day and Sunday schools in connexion with the Stanhope-street Wesleyan Chapel, has been laid in Windsor-street, Toxteth Park. The principal entrance will be from Windsor-street, and a prominent part of the elevation is to consist of a tower about 70 ft. high. In this tower is to be the principal staircase, and there will also be a large room, the roof of which is to be of ornamented timber, stained and varnished. All the stairs will be of stone, very wide, and free from angle treads. The size of the infant-school is to be 42 ft. by 30 ft., and of the infant class-room, 22 ft. by 18 ft. The girls' school and class-room will be of the same dimensions, both having attached to them cloak-rooms, 15 ft. by 10 ft. The boys' school will be considerably larger than the others, the size being 65 ft. by 33 ft. and the class-room 24 ft. by 18 ft. There will also be lavatories and other arrangements in connexion with each school. Behind the buildings there is to be an extensive covered playground, which will be divided, for the use of the boys and girls respectively. The walls are to consist of red brick, with coloured bands and white stone dressings. The boys' school is to be on the first floor. The amount of the contract is 3,000*l.*, exclusive of the fittings, which are to be of pitch pine; but including the fittings and the cost of the land, it is estimated that the total expenditure will be about 5,200*l.*, of which about 5,000*l.* have been already collected. Mr. C. O. Ellison, of Liverpool, is the architect; and Mr. J. Martin, the builder.

Fatal Accident by Fall of a Wall in Liverpool.—The County Palatine Loan and Discount Company are erecting a building at the corner of School-lane and Peter's-lane, Liverpool, just opposite the large block of buildings now erecting by Mr. Edward Willmer, under the direction of Mr. T. Mellard Reade, architect, and Mr. Joseph Greenwood, of Huyton, clerk of the works. For some time past excavations have been in progress for the formation of cellars underneath this building and a part of those occupied by Mr. Allsop, and it became necessary to "under-pin" the north gable end of Mr. Allsop's wall to the extent of 15 ft. deep. During the progress of this operation on Monday before last, this wall gave way and buried one poor fellow in the ruins. The man was got out after three hours, but was found dead. At the inquest the jury found that the deceased had been "accidenta ly killed," and accompanied their verdict with a presentment expressive of admiration of the praiseworthy manner in which a police-officer had "discharged even more than his duties."

PROVINCIAL NEWS.

East Cowes (Isle of Wight).—A new mansion has just been completed at Spring-hill, for Mr. W. G. Shedden. It is in the Early English style, the external facing being of yellow malms, from East Cowes Park estate, with Bath stone dressings. The architect was Mr. T. W. Burrell, Fareham. Messrs. T. & J. Dashwood, of Ryde, were the builders. The cost was about 8,000*l.*

Hanley (Staffordshire). — A "Hanley Hotel Company (Limited)" has been formed for the purpose of meeting the present inadequate hotel accommodation in the capital of the Staffordshire Potteries. The directors have selected an eligible site known as the Bank House Property, and have entered into a contract for the purchase of it. The property is opposite the junction of Pall-mall, Cheapside, and Albion-street, and is situate in one of the most convenient parts of Hanley. The proposed capital is 20,000*l.*, in 4,000 shares of 5*l.* each.

Hexham.—The proposed Hexham Town-hall and Corn-exchange building scheme has at length been commenced. The tenders for the different works have been selected by the directors, as follows:—Mr. T. Bulman, Hexham, mason work, 2,940*l.*; Mr. E. Herdman, Hexham, joiner work, 1,758*l.*; Mr. H. Burn, Hexham, slating, 230*l.*; Mr. Ellis, Hexham, painting and glazing, 300*l.*; Mr. Holme, Carlisle, plastering, 346*l.*; Mr. Stafford, Newcastle, plumbing, 220*l.*; Messrs. Walker & Son, Newcastle, iron work, 515*l.* It is expected that the foundation stone will be laid by Mr. Beaumont, M.P. The buildings will be in the new street, extending from the Market-place to Hencotes, and will be situate about midway between each terminus, on the side opposite the Abbey.

CHURCH-BUILDING NEWS.

Runham (Norfolk).—A feature has recently been added to the parish church of this village. The tower has long presented an unfinished appearance, owing to the want of parapet or pinnacles, which have now been erected at a cost of about 200*l.* The new work is of stone, and consists of a moulded cornice having carved gurgoyles with parapet above, and finished with stepped and moulded coping. The parapet is ornamented with sunk quatrefoils and trefoil-headed panels, which are filled in with cut flints. Crossed keys and crossed swords (the emblems of St. Peter and St. Paul, to whom the church is dedicated), are also introduced in panels of flint and stone. At the angles are pinnacles rising to a height of about 14 ft. from the cornice, and having carved crockets and finials. The works have been executed by Mr. J. Stanley, of Yarmouth, from the designs and under the superintendence of Mr. J. T. Bottle, of Yarmouth, who has succeeded to the architectural practice of Mr. A. W. Morant.

Icklingham (Suffolk).—The Church of St. James, Icklingham, which has from time to time suffered the most wanton mutilation and defacement, is now being restored at the sole expense of Mr. C. E. Gibbs, of Icklingham Hall. The brick parapets which surmounted the nave and aisle walls have been removed; the chancel is to be re-roofed and re-seated, and the floor raised to its original level; the body of the church is to be repaired and re-seated; the window tracery, which was nearly all cut out and destroyed, will be restored in accordance with the original design; and the various piscinæ, niches, &c., formerly walled up, have been opened and repaired. The works are being carried out by Mr. Jackaman, of Bury St. Edmund's, from the designs of Messrs. Bacon & Bell, of London.

Bideford (Devon).—The church of Bideford was consecrated on the 12th of January. The original church, deformed by galleries and tasteless additions, being also ruinous, was pulled down in 1862, plans for a new edifice having been prepared by Mr. Ashworth, of Exeter. The new edifice attached to the old tower consists of nave, chancel, aisles, and chancel aisles, an organ-chamber appropriated as a corporation-aisle, vestry, and two porches. The internal dimensions are 113 ft. 6 in. by 71 ft. The Perpendicular style has been adopted, following the features of the old church. The accommodation is for about 1,150 persons. The walls are of local stone, with Forest of Dean stone quoins, and Bath stone arcades and dressing. Very little of the old work could be re-used. The roofs are of red pine. The stone and wood carving was done by Mr. Seymour, of Taunton. The rebuilding has been wholly carried out by Mr. White, of Bideford. There is a stained window by Mr. Wailes in the tower, and two by Horwood in the south chancel aisle. A warming apparatus, by Messrs. Haden & Son, has been constructed in the vaults. The outlay is about 4,500*l.*, including a restoration of the tower, not yet complete.

GRINDING MONEY.

WANDSWORTH POLICE COURT.

HENRY AUSTIN, foreman to a builder carrying on works at Battersea, was summoned by Charles Legg, a carpenter, for a quarter of a day's wages, allowed in the trade, for grinding tools.

The defendant pleaded that he was not liable to pay the amount claimed.

The complainant stated, that he had been working at the rate of 5*s.* per day, the week ending at one o'clock on Saturday. At half-past twelve o'clock, on the 14th inst., the defendant gave him notice that he should not require his services any longer. He, however, continued on until one o'clock, when he was paid, minus the quarter of day allowed in the trade for grinding tools.

The defendant gave a different complexion to the case. He employed the complainant at 5*s.* for ten hours per day, with the privilege of leaving off at one o'clock on Saturday. He paid him up to half-past five o'clock, although he left off work at one o'clock, he contending that it was not compulsory only in cases in which the men were paid at the rate of 7*d.* per hour. He also said the 7*d.* per hour system had swept away the wages allowed for sharpening tools.

In reply to the magistrate, the defendant said that the money for grinding tools ought not to be given when Saturday afternoons were allowed. He believed it was not the practice in the trade. He never heard of such a custom in his life. He would swear it was not the custom in the neighbourhood in which he worked. He also said the complainant's saw was not properly sharpened when he commenced working for him.

The complainant said it was the custom in the trade when the men were discharged to be paid a quarter of a day for sharpening their tools.

Mr. Ingham dismissed the summons on the evidence given by the defendant. He also said, that if the complainant had a right to claim for grinding-money, he must go to work with sharp tools, as he could not have the privilege both ways.

Books Received.

Letter to Lord Palmerston on the Employment of our Labour and Capital at Home. By GEORGE PRESTON WHITE. London: Cornish, High Holborn. 1865.

THE immense drain of capital from this country in foreign loans, amounting to hundreds of millions, is a subject both of apprehension and of regret; and the obvious remedy would be the introduction of reproductive works to develope our internal resources, instead of allowing foreigners to do this for other countries with our capital. No single measure could be so well calculated to assist in developing our material resources as the opening up of the country by cheap railways; and this is one of the chief suggestions urged by Mr. White in the pamphlet under notice. He points especially to Ireland as requiring such assistance, and asks,—"Would it not be sound policy to devote a portion of the revenues of Ireland for such purposes, as has been done in India, but in a modified form,—as, for example, by giving a guarantee, for say only twenty years, of 5 per cent. on 5,000*l.* per mile of such railways as were deemed of national importance in a commercial and military point of view?" A guarantee of 250,000*l.* per annum, being 5 per cent. interest on a capital of five millions, would insure the execution of 1,000 miles of railway,—an outlay which might be extended over a period of five years.

Ireland, as an integral portion of the British empire, cannot remain depressed and undeveloped without proving a continued source of weakness to England; and there seems to be no more obvious or hopeful way of removing this source of weakness than by first of all opening up the country by cheap lines of railway, and then, perhaps, by carrying out an extensive system of bog and other drainage of the soil. In the reclamation of wastes there is a vast field of operations awaiting the advent of capital towards the reproductive development of Ireland.

Amongst other measures which would confer incalculable benefit on Ireland would be the occasional residence of some member of the Royal Family in the country,—the Prince of Wales, perhaps, as Lord Lieutenant. It is to be regretted that no Royal residence exists in Ireland: a grant ought to be made by Parliament for the purpose, as suggested in the *Times* by Mr. Hankey.

Another great want in Ireland is industrial knowledge and industrial education: whilst there is still a superabundance of unskilled labour, notwithstanding the removal of so much even of that to foreign countries as well as to our own colonies, there is as yet comparatively little skilled labour. Industrial knowledge makes all the difference between the poverty and weakness of Ireland and the rich and flourishing condition of England.

In urging the opening up of Ireland by railways, Mr. White says,—

"Having witnessed the extraordinary results produced in India, in France, in Spain, and other parts of the globe, by the introduction of railways, I am convinced that there is no single measure which could be devised which would produce such important benefits to Ireland, as the opening up of the country by a system of cheap railways and tramways, constructed with the utmost economy, and specially adapted for agricultural traffic; and until this be done, I fear all attempts at developing the fisheries and mineral wealth of the country, and reclaiming the waste lands, will, in a pecuniary and commercial point of view, prove a failure; cheap transit being a *sine quâ non*."

Mr. White's pamphlet is a highly important one.

VARIORUM.

"Naval Armour: dedicated to Lord Palmerston." By James Chambers. London: Mitchell, Charing-cross. The author of this pamphlet is the inventor of the Chalmers target, in favour of which a good deal has been said in the public press within the last two or three years. As in so many other instances, Mr. Chalmers complains of the really stupid proceedings of the Admiralty. He quotes the strange and startling dictum of their "Controller," that "relative resistance to shot has no bearing on the question" of naval armour.

"If Britannia," says Mr. Chalmers, "were prepared to lay down her trident sceptre, and bury her power and glory beneath the waves she has ruled so long, she could not desire *undertakers* better qualified than the present Controller and Chief Constructor of the Navy. Nor could she find fitter *shrouds* and *coffins* than the thin-sided and partially-armoured ships which the admiralty has prepared for her. To carry out the simile, 'My Lords,' who seem willing to follow wherever their officials may lead, would make most respectable *pall-bearers*; whilst the Government and Parliament could attend as *chief mourners*, deploring the sad fate they seem unable to avert. Whatever part in the humiliating pageant may be assigned to Britain's humbler sons, I, for one, will be no *mute*. Let him chant a funeral dirge who may, my song shall be 'Rule Britannia.'"

Miscellanea.

THE TUNNEL UNDER THE SEVERN.—We learn that this project, so far as the coming session is concerned, is abandoned, there not being sufficient funds provided to meet the requisite deposit, estimated at 6,000*l.*

LONDON FIRE-ENGINE ESTABLISHMENT.—Captain Shaw's "Report to the General Committee" of this establishment contains some useful observations and suggestions, and will require to be returned to.

THE LOCAL GOVERNMENT ACT.—At Guisborough, a meeting has been held, at which it has been unanimously resolved to adopt the Act for the township. The number of members to form the Local Board of Health will be twelve.

THE STRAND MUSIC-HALL COMPANY.—Three petitions have been presented in Chancery for the winding up of this company. All the amount paid on calls, together with 35,050*l.* borrowed on bonds, had been expended on the hall and the business. The company was unable to pay its debts, amounting to about 45,000*l.* One of the petitioners was of opinion that if the Music-hall were sold as a going concern, the assets would not amount to more than 20,100*l.* The sheriff took possession of the hall on the 14th January, and the provisional liquidator had let the hall at 65*l.* a week.

DISCOVERY IN WELLS CATHEDRAL.—The dean and chapter having determined to introduce gas into the choir of the cathedral for the use of the clergy and vicars choral, the workmen, under the personal superintendence of Mr. Kelway, in making an opening under the stalls on the south side of the choir, came upon a thick, massive slab of freestone, which was found to cover a stone coffin of ponderous size and weight, and of the shape in which they were usually made at an early period,—viz., wide at the head, tapering off narrower to the feet, with square corners, but without the modern widening at the shoulders. In the side or edge of the coffin, on the left side, and near the head, was found a small plate of lead, inserted in the stone, rudely engraved in the characters of the period, with the following inscription:—

"Hic jacet Willielmus de Buttona secund.
Bathoniensis et Wellensis Episcopus.
Sepultus XII. die Decembris Anno Domini
MCCLXXIIII."

The tomb is not opposite the bishop's grave, but several feet to the east of it.

WORKING-CLASS DWELLINGS IN LEEDS.—The mayor of Leeds (Mr. Luccock) some months ago offered a prize of 5*l.* for the best essay on the dwellings of the working classes in the borough. Mr. W. B. Denison, Mr. T. Dawson, and Mr. J. Taylor were selected as the adjudicators, and they have awarded the prize to the essay by Mr. James Hole, the author of "Light, More Light," and the secretary of the Yorkshire Union of Mechanics' Institutes. The writer has entered into an examination of the character of the dwellings of the working classes in Leeds, and adduced ample evidence that the mass of these dwellings are of so deficient a nature and encompassed with evils that materially increase the mortality of the town, and produce great social evils. The following is a recapitulation of the measures which he believes will remedy the evils he points out:—1. The extension of the Common Lodging-house Act. 2. The vigorous enforcement of the powers already possessed by the Corporation and the Board of Guardians for the prevention of nuisances, &c. 3. Applying the Local Government Act, and also obtaining powers to regulate the laying out of streets, public improvements, &c. 4. The establishment of societies to assist in the erection of dwellings on sanitary principles; and 5. The erection of additional lodging-houses in different localities. Beyond these, by the influence of temperance and education, they might hope also to assist in checking these evils.

CLIFTON SUSPENSION BRIDGE.—The bridge has been opened for carriage traffic. It is reported that there is no perceptible oscillation in the roadway.

RADCLIFFE INFIRMARY, OXFORD.—The building committee appointed to carry out the erection of the accident ward, &c., at the Radcliffe Infirmary, which are now completed, have issued a financial statement, from which it appears that the total amount of receipts was 7,113*l.* The expenditure includes sums "paid for various contracts for building the new accident ward, out-patients' hall, medical officers' receiving-rooms, including warming apparatus, fittings, furniture, advertising, printing, and architect's commission, 6,628*l.* 11s."

SOUTH KENSINGTON MUSEUM.—A large part of the collections illustrative of building materials and construction, recently exhibited in the temporary iron building at South Kensington, has been removed to the south arcades overlooking the gardens of the Royal Horticultural Society, where it will be again exhibited to the public, and the usual facilities for study and comparison afforded as soon as the necessary arrangements can be made. The part removed comprises a collection of stone for building and architectural decorations, British and foreign marbles, cements, ornamental terra-cotta, tiles, woods, &c.; together with a number of interesting models of public buildings.

LIVERPOOL ARCHITECTURAL SOCIETY.—At the meeting on the 25th ult., Mr. Joseph Boult, in the chair, read a letter from Mr. Ellison, in which that gentleman, after explaining that, being unable to attend, he was compelled to do by letter what he had intended to do in person, went on to say that he must protest against the reading of a paper by Mr. Rollet until the dispute concerning the construction of the roof was settled, for he thought the society had no right to mix itself up in a question of such extensive importance; and that under the circumstances the reading of the paper, or a discussion on the subject, would add very materially to the difficulties of the case, Mr. Rollet being one of the principal parties concerned on the construction of the North Haymarket roof. The chairman observed that Mr. Rollet being—according to Mr. Ellison's statement—one of the principal parties concerned, it seemed only just and right that he should choose his own time, consistently with the convenience of the society. Mr. Rollet accordingly read the paper in question.

BURSTING OF A KITCHEN BOILER.—Another of these accidents has occurred,—and in the north of England, as usual. It took place on Wednesday, at the residence of Mr. Jonathan Whitehead, cotton broker, Elmsley House, West Derby. In the kitchen there was an ordinary range, a high-pressure boiler being placed immediately behind the firegrate. It was on the circulatory principle,—one pipe conveying water from the cistern into the boiler, while by another the heated water re-ascended into the cistern. The fire-place had not been used for two or three days; but a fire was lighted in the grate, and in the evening the boiler burst with a violent explosion, inflicting dreadful injuries on a woman and scalding a man. The interior of the kitchen was a perfect wreck, as well as the windows, door-frames, and walls. The dresser also took fire. There must be something wrong in the construction of kitchen boilers in the North.

SANITARY IMPROVEMENT OF BURNLEY.—A good deal of paving and pipe-sewerage has of late been carried out at Burnley, according to the report for last year by the borough surveyor, Mr. Colbran, who says, in allusion to these matters, at the close of his report,—"It is proved, from statistical returns of the registrars, that the effects of sewering and paving are most beneficial; for in Chorlton the mortality in the undrained streets was 4 per cent.; in the drained streets 2 per cent. only;—in Rochdale, well-conditioned localities, deaths to population 1 in 43 1-10th; ill-conditioned localities, 1 in 22 4-10ths;—in Liverpool fifteen courts badly drained contained 307 dispensary cases, while the same number, well drained, contained only 109 cases, the population of both courts being nearly equal. Similar data were obtained in several other towns; and immediately after putting the streets in proper condition a decrease of mortality ensued. If these results follow in Burnley it is impossible to conceive that your committee could have expended the money more judiciously."

HER MAJESTY'S THEATRE.—M. Maillart's opera, *Lara*, adapted for the English stage by Mr. Oxenford, has proved a success, and will, we have little doubt, fill the house for some time to come. The music is exceedingly agreeable throughout, and Miss Louisa Pyne both acts and sings in it admirably. A *débutante*, Miss Romer, acquits herself satisfactorily, and the general getting up is good. The plot is compounded out of Byron's two poems, "Lara" and the "Corsair." How is it, people are beginning to ask, that Mr. William Harrison himself has not yet sung in his new house?

THE WELLINGTON CLOCK TOWER.—The clock-tower at the foot of London Bridge, narrowing the space too greatly, is to be taken down. When its erection there was determined on, we pointed out the mistake that was contemplated, and said that its removal, when up, would be but a question of time. That time has come.

OUR RAILWAY SYSTEM.—The first meeting of the Department of Economy and Trade of the National Association for the Promotion of Social Science was held on Tuesday night, at their rooms, 1, Adam-street, Adelphi. Mr. Edwin Chadwick, C.E., the president of the Department, occupied the chair, and read an interesting paper on "The Economical Principles of a Reform of the Legislation and Administration for the Conveyance of Goods and Passengers by Railways." An important discussion followed.

RAILWAYS AFFECTING THE CITY.—Mr. William Haywood's report on the projects of the railway and other companies applying for powers to construct works within the City of London, has been published. In conclusion, Mr. Haywood says, "The total area, including public ways, scheduled within the City for the several projects reported upon is 31 acres, but of this about 18 acres are already authorized to be taken under existing Acts, leaving 13 acres which are scheduled for the first time, of which about 10¼ acres is property, and 2¼ acres is public way." He advises, as a preliminary step, that the court should dissent from all of them.

THE WATER SUPPLY AND SEWERAGE OF BLAYDON.—Mr. Jos. Gordon, city surveyor, Carlisle, has, in compliance with a request from the local Board of Health of Blaydon, reported upon the water supply and sewerage of the Blaydon district. The result of Mr. Gordon's inspection and survey estimates the cost of the proposed additional water supply at 1,934*l.*, and the sewerage works at 3,510*l.*; making a total of 5,444*l.* These figures include the cost of superintendence of construction, and all contingencies incidental to such undertakings; and Mr. Gordon has laid before the Board a detailed report of the whole works.

ON THE PROPULSION OF TRAINS ON LINES WITH FREQUENT STATIONS.—A paper "On the Best Mode of applying Power to propel Trains on the Metropolitan and other Railway Lines having frequent Stations and in terminal Stations," was read on the 18th of January by Mr. P. W. Barlow, F.R.S., at the Society of Arts. Mr. Barlow recommends a modification of the rope traction system with stationary power to give temporary impulse in the place of locomotives. He says:—"When the duty to be performed is that of working a line in which the stations are very close together, and the stoppages frequent, it then results that all, or nearly all, the work of the engine is expended in acquiring the travelling speed; and that, in fact, it has not ceased to accelerate its speed when it becomes necessary to shut off the steam and apply the brakes, so as to stop at the next station. In fact, the same engine which in long stages would make an average speed of 35 or 40 miles per hour, is incapable, with frequent stations, of making an average speed of 13 or 14 miles, even with a greatly reduced load. In this condition of things, which is in fact the condition of metropolitan railways, a new set of circumstances has to be met, and the question arises whether, where these circumstances exist, stationary power, when applied in a manner strictly adapted to the case, is not more economical—capable of greater speed—and in all respects more suitable to the convenience and exigences of the traffic and locomotive power?" The present system, it appears, is wasteful of power, and expensive in working. In the discussion which followed, however, the speakers were by no means unanimous as to the advantages of Mr. Barlow's proposal.

ACCIDENT AT KING'S-CROSS-ROAD.—On Wednesday afternoon, shortly after one o'clock, a small building in front of St. Philip's Church, which was in course of removal, fell down, injuring a bricklayer named Thomas Searle rather severely.

THE STAINED GLASS IN HEREFORD CATHEDRAL.—A paper on this subject, by the Rev. F. T. Havergal, was read by that gentleman at a recent *soirée* in connexion with the Herefordshire Philosophical, Antiquarian, and Natural History Society. After giving some account of the ancient use of stained glass, he said,—We must now draw your attention to the second part of our subject, viz., "The Ancient and Modern Stained Glass of our own Cathedral." That this edifice was once gorgeously filled with stained glass there is every reason to believe. Historians of the Norman and Early English period are quite silent, but yet we may fairly infer that as the carving and paving, wall and ceiling decoration, were all very beautiful, so we may, I say, safely presume that the windows were filled with the highest efforts of art. The oldest specimen that remains with us, is to be seen on the south side of the Lady Chapel. Adjoining it is another, said to be Munich glass, formerly in St. Peter's Church, Hereford. The next specimens we possess belong to the Decorated period, two windows having been very successfully restored last year by Mr. Warrington. Mr. Havergal here quoted Rawlinson's description of the windows formerly in the cathedral (p. 140), and then noticed those in Bishop Audley's chapel and the Old College chapel. He then briefly noticed the modern windows, nineteen in all,—six by Castell in triforium of choir; one by Hardman, in east end of choir; five by Warrington (including three to Archbishop Musgrave, one to Canon Clutton, and one to Bishop Huntingford); one by Clayton & Bell; and five by Gibbs. Out of 100 windows admitting light to the interior of the cathedral, Mr. Havergal remarked that at present twenty-three were filled with stained glass.

TENDERS.

For warehouse, exclusive of plumber's, glazier's, painter's, and ironfounder's works (which are 130*l.*), for Navigation Company, Horncastle. Messrs. Bellamy & Hardy, architects:—

Hall & Co.	£990 0 0
Booth	910 0 0
Huddleston	898 0 0
Wallis	860 0 0
Carter	860 0 0
Morley & Co.	820 0 0
Pike & Co. (accepted)	798 0 0

For completely finishing the carcasses, Nos. 5, 7, and 8, Gordon-terrace, Upper Richmond-road, Putney. Messrs. Charles & Sydney Lee, architects:—

Aviss & Sons	£1,302 0 0
Pain	1,288 0 0

Accepted for building new Borough Gaol at Scarborough, Yorkshire. Mr. W. B. Stewart, architect:—

Bricklayer, Mason, and Plasterer's Work.

Petch	£4,880 19 0

Slater's Work.

Hardgreaves	£137 10 0

Carpenter and Joiner's Work.

Kelly	£1,180 0 0

Smith and Founder's Work, &c.

Waters	£2,280 0 0

Painter's Work.

Ruddock	£127 15 0

Plumber and Glazier's Work.

Harrison	£149 0 0

Accepted for pine and peach houses at Endcliffe Hall. Messrs. Hockton & Abbott, architects:—

Contract No. 14.

Bricklayer, Joiner, Slater, and Plasterer's Work.

Craven, Brothers	£738 0 0

Plumber, Painter, and Glazer's Work.

Townsend	£155 0 0

Smith's Work.

Ellis	£400 0 0

Contract No. 15.—Forcing-houses.

Bricklayer and Joiner's Work.

Wade	£215 0 0

Plumber, Painter, and Glazier's Work.

Bissett	£40 0 0

Smith's Work.

Ellis	£123 10 0

For completion of ten houses at Kentish-town, for Mr. Henry Gibbon. Mr. Edward Clark, architect. Quantities supplied:—

Rowe (accepted)	£1,676 0 0

For Sewer.

Rowe (accepted)	£150 0 0

For coal-office, stables, and coal-shed, and sundry works, at Messrs. Rickett & Smith's Wharf, Grove-road, Bow. Messrs. Tillott & Chamberlain, architects:—

Cannon	£1,111 0 0
Wills	1,094 0 0
Tolley, jun.	1,029 0 0
Nagle	935 0 0

For additions and alterations to premises in Church-street, Hackney, for Mr. Rose. Mr. Gliddon, architect:—

Ennor	£564 0 0
Salmon	490 0 0
Skinner	475 0 0
Snewin, Brothers	404 0 0

For the erection of chemical works at Hackney Marsh, for Messrs. Simpson, Maule, & Nicholson. Mr. C. Cooper, Maidenhead, architect. Quantities supplied:—

Dabbs	£8,490 0 0
Hack & Son	7,997 0 0
Sawyer	7,653 0 0
Henshaw (accepted)	7,328 0 0

For water tank, and girders under ditto:—

The Regent's Canal Iron Work Company	£364 0 0
Ransomes & Sims (accepted)	335 0 0

For building warehouse in London-wall. Mr. C. Lawes, architect. Quantities not supplied:—

Patrick & Son	£1,134 0 0
Brass	1,088 0 0
Dove, Brothers	1,025 0 0
Rawlins	986 0 0
Hardiman & Sandon	984 0 0
Prince	983 0 0
Cannon	945 0 0
Bostell	897 0 0
Anley	844 0 0

For building warehouse in Gun-square, Minories, for Mr. Haynes. Mr. T. C. Clark, architect:—

Tracey	£3,987 0 0
Hack & Son	3,597 0 0
Patman & Co.	3,498 0 0
Ashbey & Son	3,455 0 0
Downs	3,293 0 0
Lawrence & Son	3,172 0 0
Conder	3,138 0 0
Brass	3,136 0 0
Sharpington	3,123 0 0
Anley	2,942 0 0
Hardiman & Sandon	2,913 0 0

For an inn in the Wellington-road, St. Mary Cray, Kent, for Messrs. Fox & Sons, Farnborough. Messrs. George & Vaughan, architects:—

Townsend	£648 0 0
Francis & Son	640 0 0
Lose	543 0 0
Sales	533 0 0

For two houses and shops at Beccles, for Mr. W. E. Crowfoot, M.D. Mr. W. O. Chambers, architect:—

Rix & Brett	£827 5 9
King & Blunderfield	799 10 0
Woodroffe	700 0 0

For two semi-detached villas on Kirtley Cliff, South Lowestoft, for Mr. Burk. Mr. W. O. Chambers, architect:—

Swatman	£1,047 0 0

For a house and shop at Beccles, for Mr. Garnham Mr. W. O. Chambers, architect:—

Rix & Brett	£316 18 4
King & Blunderfield	275 10 0

For alterations to and enlargement of St. Mark's parsonage-house, Kennington. Mr. Ewan Christian, architect. Quantities supplied by Mr. T. W. Goodman:—

		Extra on Portland cement.
Sharpington & Cole	£1,295	£44 0
Rhodes & Roberts	1,177	31 0
Marsland & Son	1,165	28 0
Stimpson	1,090	36 0
Lathey, Brothers	1,081	28 10

TO CORRESPONDENTS.

SETTING PENCIL DRAWINGS.—(In setting pencil drawings, to prevent them from smearing, how can the pencil-lines be made to retain the brilliancy they had before setting?—B. & H.)

W. H. S. (voluntary Examinations have been organized by the Institute of Architects, where "forms" may be obtained).—W. C. (not necessary).—R. T. A. (sent to correspondent).—Measure and Value (should send name).—Quondam (next week).—Muses (see our Vol. 22, p. 337).—H. J. (in type).—W. P. (ditto).—W. O. C.—W. H. V. S.—C. C.—H. D.—F. R. W.—W. B. S.—J. F.—W. H.—F. E. jun.—J. B.—R. P. P.—C. V.—B.—J. R.

We are compelled to decline pointing out books and giving addresses.

All statements of facts, lists of tenders, &c., must be accompanied by the name and address of the sender; not necessarily for publication.

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